INTERNATIONAL SPACE STATION PAYLOAD ACCOMMODATIONS HANDBOOK

PAYLOAD PROCESSING ACCOMMODATIONS AT KSC

BASELINE

JUNE 21, 2001

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
INTERNATIONAL SPACE STATION PROGRAM
JOHNSON SPACE CENTER
HOUSTON, TEXAS

REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
-	Initial Release (Reference per SSCD 005431, EFF. 07-20-01)	07-30-01

APPROVAL PAGE

KSC ISS
Payload Accommodations
Handbook

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SECTION I – INTRODUCTION

1.1 Purpose

The *International Space Station Payload Accommodations Handbook (PAH), SP-52000-PAH-KSC,* describes the philosophies and accommodations that are used by Kennedy Space Center (KSC) to support experiment-type payload ground processing from prelaunch to post-landing operations. Prelaunch activities include: advanced planning; off-line preparations; payload integration; test and checkout; Orbiter Interface Verification Test (IVT); and late access to install conditioned cargo and middeck experiments into the Orbiter at the launch pad. Post-landing activities include support of early access to remove middeck experiments and conditioned cargo from the Orbiter at KSC or at the Dryden Flight Research Center (DFRC).

This document describes KSC payload community capabilities and the utilization of program resources in order to process ISS payloads from prelaunch through postlanding.

1.2 Scope

The KSC PAH describes ground processes and accommodations for experiment-type payloads in the ISS era, both prelaunch and post-landing, as well as necessary ground support equipment (GSE). Hereafter, in this document, experiment-type payloads are referred to simply as payloads with the exception of middeck experiments; elements such as the Multi-Purpose Logistics Module (MPLM) are identified directly by name or by the generic term "element". Processing locations identified include the Space Station Processing Facility (SSPF) Intermediate-Bay (I-Bay), the SSPF and Operational and Checkout (O&C) Building Off-Line Processing Areas (OLPA), the Life Science Support Facility (LSSF), the SSPF High Bay, the Resupply and Return (R&R) rack integration room, the launch pad, the Shuttle Landing Facility (SLF), and the DFRC.

1.3 Authority

The KSC PAH is prepared by the KSC NASA Utilization Division, and the latest version is available in the Program Automated Library System (PALS). (Web site: http://iss-www.jsc.nasa.gov/ss/issapt/pals/)

1.4 Documents

The current issue of each document is applicable. Shaded documents are specifically called out in this document.

Table 1.1 Reference Documentation

DOCUMENT NUMBER	DOCUMENT TITLE
K-CM-05.4.2	*Guide to Space Station Processing at KSC*
K-SS-10.5	*KSC Payload Processing CoFR Implementation Plan*
K-SS-12.09	*Station Operational Logistics Requirements*
K-SS-12.17	*ISS & Payloads Receiving & Shipping Guidelines*
K-STSM-14.1	*Launch Site Accommodations Handbook for Payloads*
K-STSM-14.1.14	*Facilities Handbook for the Operations and Checkout Building*
K-STSM-14.1.16	*Space Station Processing Facility Processing and Support Capabilities*
K-STSM-14.1.9	*Facilities Handbook for Life Science Support Facility*
K-STSM-14.2.1	*KSC Payload Facility Contamination Control Requirements/Plan*
NSTS 08171	*Operations and Maintenance Requirements and Specification Document*
SFOC-PM0102	*Product Development Plan for Time-Critical Ground Handling Requirements Table PDP MS3-012*
SSP 41002	*ICD: International Standard Payload Rack to NASA/ ESA/NASDA Modules*
SSP 41017	*ICD: Rack to Pressurized Logistics Module, Part 1*
SSP 41155	*Refrigerator/Freezer Rack to MPLM Interface Control Document*
SSP 50108	*ISSP CoFR Process Document*
SSP 52000-PDS	*Payload Data Sets Blank Book*
SSP 52054	*ISSP Payloads Certification of Flight Readiness Implementation Plan*
N/A	*Guide to Science Payload Processing*
N/A	*Experiment Hardware Handling Guide*

1.5 Payload Ground Processing

Payload ground processing operations at KSC are scoped to satisfy International Space Station Payload Program requirements, Space Shuttle Program requirements, and Payload Developer (PD) requirements. These requirements include program policy direction; ISS system, operational, and mission requirements; the Boeing Prime requirements, and the International Partners (IP) requirements. This information serves as a basis from which KSC develops ground processing plans for payload flows at KSC.

During off-line Payload ground processing operations PDs work to processing methodology and implementing instructions as agreed to by the International Space Station Program (ISSP) and KSC NASA Safety, as appropriate. On-line Payload ground processing operations are conducted within the context of current KSC Space Shuttle payloads processing methodology, that is, KSC implementing instructions (e.g., nonconformance reporting, etc.) will govern those transactions for which KSC has lead responsibility.

All KSC documents (prefaced by “K”) are available through the KSC Customer Integration Manager (CIM). All other documentation is available on PALS.

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SECTION II – PLANNING

2.1 General Description

Planning for ground processing of ISS payloads at KSC begins with the initial definition of technical, operational, support, configuration, and schedule requirements associated with a payload or support equipment. KSC works with PDs and numerous program organizations to develop an approved set of requirements and schedules. KSC then develops and implements the plans necessary to satisfy all requirements during KSC ground processing per coordinated schedules.

Planning at KSC is essentially a continuous process. Planning can begin as early as during the design phase of a payload and/or GSE item, continue during early mission planning, occur during mission processing (including post-flight activities), and include routine operations and maintenance and sustaining activities which may be required between missions.

The following processes are discussed as part of overall Planning activity:

- Design and Development Process
- Payload Assignment Process
- Requirements Management Process
- Operations and Schedule Development Process
- Work Authorization Document (WAD) Development Process

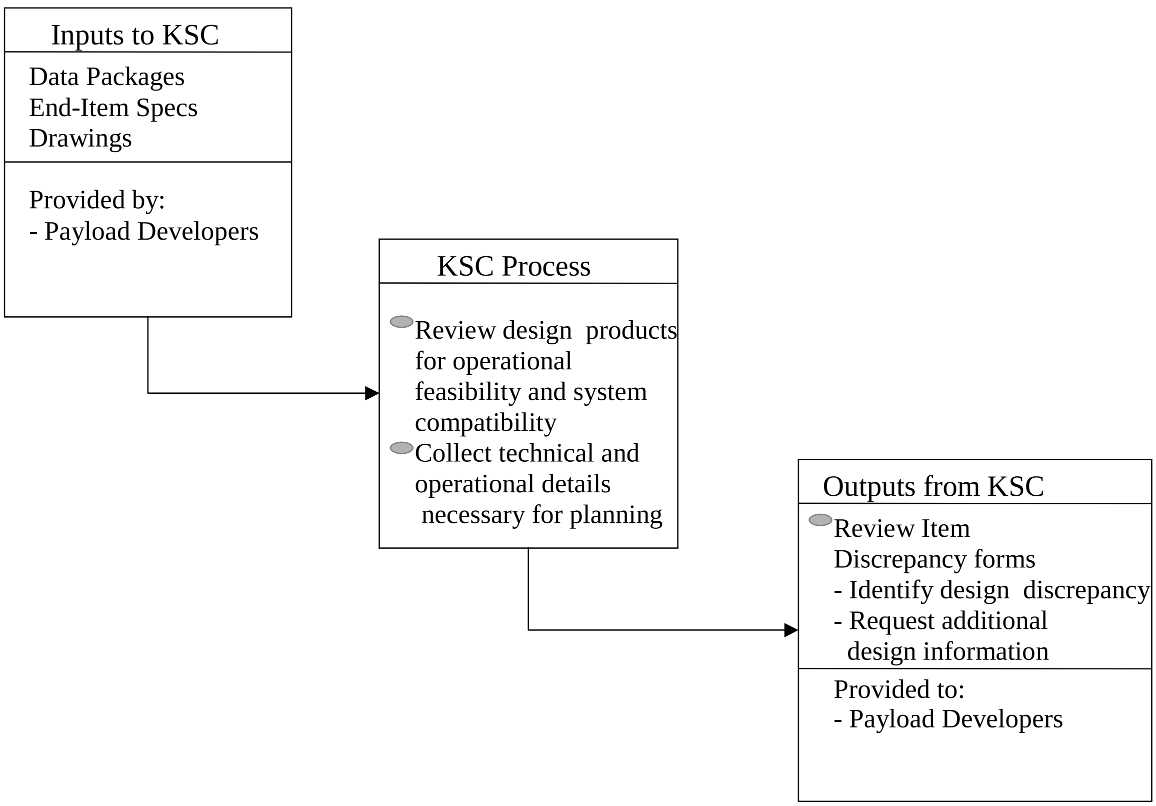
Due to the generic nature of these planning processes, they are described as being applicable to all payload classes (Facility Class Payload Rack, EXpedite the PRocessing of Experiments to Space Station [EXPRESS] Rack, EXPRESS Pallet, Attached Payloads, and Middecks). Planning details unique to a specific payload class are noted.

2.1.1 Design and Development Process

KSC participates in the design and development of payloads and GSE for which they will have responsibility to use, operate, maintain, and/or sustain at the launch site. Payload Design reviews, Payload/Middeck Ground Operations Working Group (PGOWG) meetings and Technical Interchange Meetings (TIMs) between KSC, the ISS Program, and PD personnel are held at KSC as needed. KSC personnel may also travel to support PD site testing as required. Involvement in this process provides KSC and PD personnel the opportunity to gain important technical and operational details necessary for effective planning.

Developers of payload hardware typically follow a development and review process that includes major milestones such as Preliminary Design Reviews (PDR) and Critical Design Reviews (CDR). Engineering design data and drawings are provided as data packages to allow KSC to participate in the review process. Review Item Discrepancy (RID) forms are used to identify design discrepancies or to gain additional design information from the hardware developer. See Figure 2.1.1 below for the Payload Hardware Design and Development Process.

Figure 2.1.1 Payload Hardware Design and Development Process



2.1.2 Utilization Payload Assignment Process

KSC assigns engineers to work payload processing and will provide a list of appropriate technical contacts.

2.2 Utilization Requirements Management Process

The review and definition of requirements to be implemented at the launch site is a critical part of the payload planning process. KSC personnel review and approve requirements based on acceptable technical, schedule, and cost criteria. Types of requirements to be defined include technical requirements, support requirements, ground application software requirements, and configuration requirements.

2.2.1 Technical Requirements

The Operations and Maintenance Requirements Specification (OMRS) is the single authoritative source for non-drawing organizational level operations, maintenance, data and analysis requirements, and specifications (flight vehicle, payload and ground systems) that are necessary to maintain and verify the system (element, subsystem, or Line Replaceable Unit (LRU)/Maintenance Significant Item (MSI)) operational readiness. These OMRS requirements include test, checkout, servicing, pre-planned maintenance, inspection, safety, general, data, time critical operations, and analysis requirements. This section defines the products, activities, roles, responsibilities, and interfaces required to develop the OMRS system Flight Products.

2.2.1.1 Technical Requirements Data Entry

Payload requirements levied on KSC that are Space Shuttle Program (SSP) Non-Standard Services are negotiated and documented in the Payload Integration Agreement (PIA) Addendum. The corresponding details of these addendum requirements, along with the ISS Standard Services, are initially entered as KSC Technical Requirement inputs by the PD. The initial PD KSC Technical Requirements Data Set (TRDS) inputs reside on the Payload Data Library (PDL) until downloaded onto the KSC computer system in the format of OMRS requirements or in the Time Critical Ground Handling Requirements (TGHR) Table. These payload-unique technical requirement inputs are the detailed Payload Operations and maintenance requirements that are to be levied on KSC. These technical requirements are those which KSC is to perform on a Payload during prelaunch, launch, recovery, and turnaround operations. These requirements correspond to either NSTS 08171, *Operations and Maintenance Requirements and Specifications Document*, File II, Volume 2, for Orbiter impacts (either Middeck Experiment or Payload Bay) or to the OMRS File VIII, Volume 2, for KSC Standalone (non-Orbiter) impacts. Time-critical and schedule-driven Orbiter crew compartment requirements collection for payloads follow a similar process to the OMRS File II Volume 2 process, but the format follows the TGHR Table format as documented in SFOC-PM0102, *Product Development Plan for Time-critical Ground Handling Requirements Table PDP MS3-012*.

The KSC Technical Requirements Data Set Manager (DSM) (or Technical Integration Manager (TIM)) leads the development, integration, and baseline of the KSC Technical Requirements Data Set. All KSC Technical Requirements data will be initially electronically input into the PDL. The TIM will assist the PD (if requested) with the input of these requirements into the PDL and will ensure that the PD’s technical requirement inputs have been downloaded from PDL into the appropriate OMRS/TGHR system.

2.2.1.2 Technical Requirements Integrated Review

An integrated iterative review cycle will assure the distribution and review of the OMRS/TGHR Flight Products and the subsequent baseline at the appropriate control board. During the review cycle, the PD can access the KSC requirements Web site via the PDL Web link. At this dedicated KSC Web Site, all of the related PD unique OMRS and TGHR files can be found for electronic review, comment and eventual approval (i.e. electronic signature).

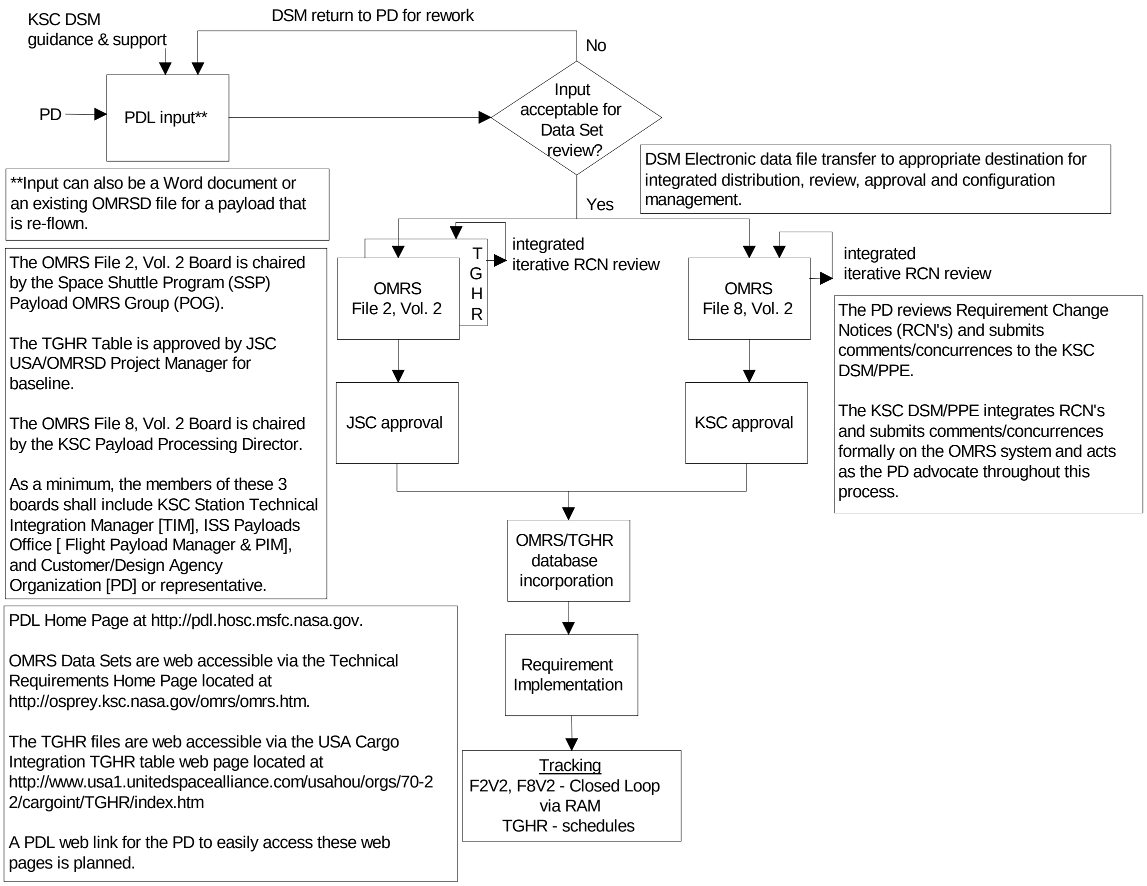
2.2.1.3 Technical Requirements Configuration Control and Tracking

Upon agreement, the KSC Analyst is notified that the comments/votes are ready for download onto the Shuttle Processing Data Management System (SPDMS). PD involvement in the formal OMRS/TGHR board process will be assured, and if requested by the PD, the TIM can represent the PD during this process. Only agreed upon requirements will be baselined. Any technical changes would first require a new TIM/PD agreement before Board approval. PD technical requirement issues that arise during this process are worked within the Payload Mission Integration Team (PMIT). Unresolved issues are taken to the International Space Station Program (ISSP) Payload Control Board (PCB) by the Flight Payload Manager (FPM). The PCB is chaired by the Space Station Payloads Office Manager.

The contents of the KSC Technical Requirements Data Set are controlled by the SPDMS/OMRS/TGHR Boards. The OMRS File II, Volume 2 Board is chaired by the SSP Payload OMRS Working Group (POG). The OMRS File VIII, Volume 2 Board is chaired by the KSC ISSP Payload Processing Director. The TGHR Table is approved by the JSC USA/OMRSD Project Manger for baseline. These three boards encompass the change authority of the KSC Technical Requirements Data Set which is resident on the SPDMS/OMRS/TGHR systems. Closed-Loop Tracking is implemented to account for all OMRS requirements and provide status for milestone assessment. The TGHR Table requirements are not Closed-Loop Tracked because schedules are typically used to status and track schedule driven requirements such as those found in the TGHR Table.

See Figure 2.2.1.3 for the KSC Technical Requirements Management Process for Station Payloads. For OMRSD details, reference NSTS 08171, OMRSD, File I, Introduction. For TGHR details, reference SFOC-PM0102 Product Development Plan for Time-critical Ground Handling Requirements Table PDP MS3-012. For PDL and Data Set details reference SSP 52000-PDS, *Payload Data Sets Blank Book* .

Figure 2.2.1.3 KSC Technical Requirements Management Process for Station Payloads



2.2.2 Configuration Requirements

A method for documenting incorporation of the Payload configuration requirements and traceability for flight hardware is implemented by KSC. Configuration accounting concepts are implemented for recording, maintaining, and reporting the current status of the baseline configuration for each mission at any point in time. Two products which support this process are the Engineering Configuration List (ECL) and the As-Built Configuration List (ABCL).

The ECL is a listing published by the respective payload design agency establishing a specific payload configuration. The ECL is comprised of documents provided by the design center which reflect new and/or revised drawing requirements. The ECL reflects top-level drawings, installation drawings, or indentured drawings which are change letter sensitive.

The ABCL is a KSC generated listing of the design agency ECL payload requirements reflecting the latest configuration with the appropriate WADs referenced to provide traceability. The ABCL documents incorporation of the design center and/or PD drawing/hardware requirements. The ABCL provides previously documented hardware configuration and reflects hardware requiring removal, installation, or reconfiguration. The ABCL provides disposition of the progression of revision level or EO changes since last installation, and contains equivalency statements and/or mismatch rationale as they pertain to the ECL or ABCL. Upon WAD completion, the ABCL is populated with as-built data by a Configuration Engineering Analyst (CEA). Discrepancies are resolved jointly between the analysts, the TIM, and the Payload Mechanical Engineer (PME). The TIM and analysts also work together to provide ABCL status at major milestone reviews.

The PD submits an ECL for use via the PDL. The PD logs on to PDL and goes to the Configuration Data Set. Within that Data Set there is an "ECL" electronic location that is filled in by the PD. KSC will receive an integrated stowage ECL from JSC stowage integration and integrate this with the various payload ECLs from PDL to create an overall mission ECL. KSC utilizes the existing Payload Data Management System (PDMS) Configuration Engineering (CE) application capabilities which permit the sharing of data between other applications and other centers, such as JSC and MSFC. This capability allows design centers to electronically transmit ECLs and subsequent revisions, which are downloaded at KSC to develop the ABCL. ECL revisions are electronically compared to the ABCL; mismatches are resolved electronically by KSC and the design center via the PDMS II network.

2.2.3 Support Requirements

Support requirements include services and facility-related support such as power, environmentally controlled integration areas, office space and furniture, security, handling equipment, communication equipment, photography, and x-ray. The PDL facilitates the definition, review, and approval of PD support requirements through the use of the KSC Support Requirements Data Set.

The Support Requirements Data Set process begins approximately at L-16 months (see Figure 2.2.3) with PD entry on the PDL for payload processing scenario and support requirements anticipated during launch and landing site ground processing. The assigned KSC CIM works collaboratively with the PD, as required, during this phase of data entry. At L-12 months, the Data Set is promoted from Private to Integrated and the CIM begins the KSC assessment. This phase involves the KSC preliminary review of the PD provided information toward an assessment of capabilities to satisfy the payload requirement. The results of the KSC assessment of capability are entered into the Data Set.

At L-9 months, the Support Requirements Data Set (SRDS) development process is mature. The PD and the CIM approve the Data Set jointly, and KSC's internal commitments to support requirements are input to the data sets. PDL produces a Launch Site Support Plan (LSSP) output report for each set of payload support requirements. These PDL generated LSSPs are submitted by Change Request to the element launch package Mission Integration Plan (MIP) Annex 8, LSSP-Baseline as individual (Annex 8) Addenda LSSPs. At L-7 months, or 30 days prior to arrival, the LSSP Addenda are approved and become part of the baseline LSSP.

At approximately L-6 months, the Payload is delivered to KSC and begins the ground processing for launch. (Arrival for science processing will vary depending on the complexity of the experiment. The specific times will be negotiated between KSC and the PD.) During this period, changes to support requirements are provided on a real-time support basis, but a real-time update of the Data Set is not required. During a post-mission review, significant changes to the "as-run" support requirements will be added to the Data Set and then the Data Set will be placed in the PDL archive.

2.2.4 Ground Applications Software Requirements

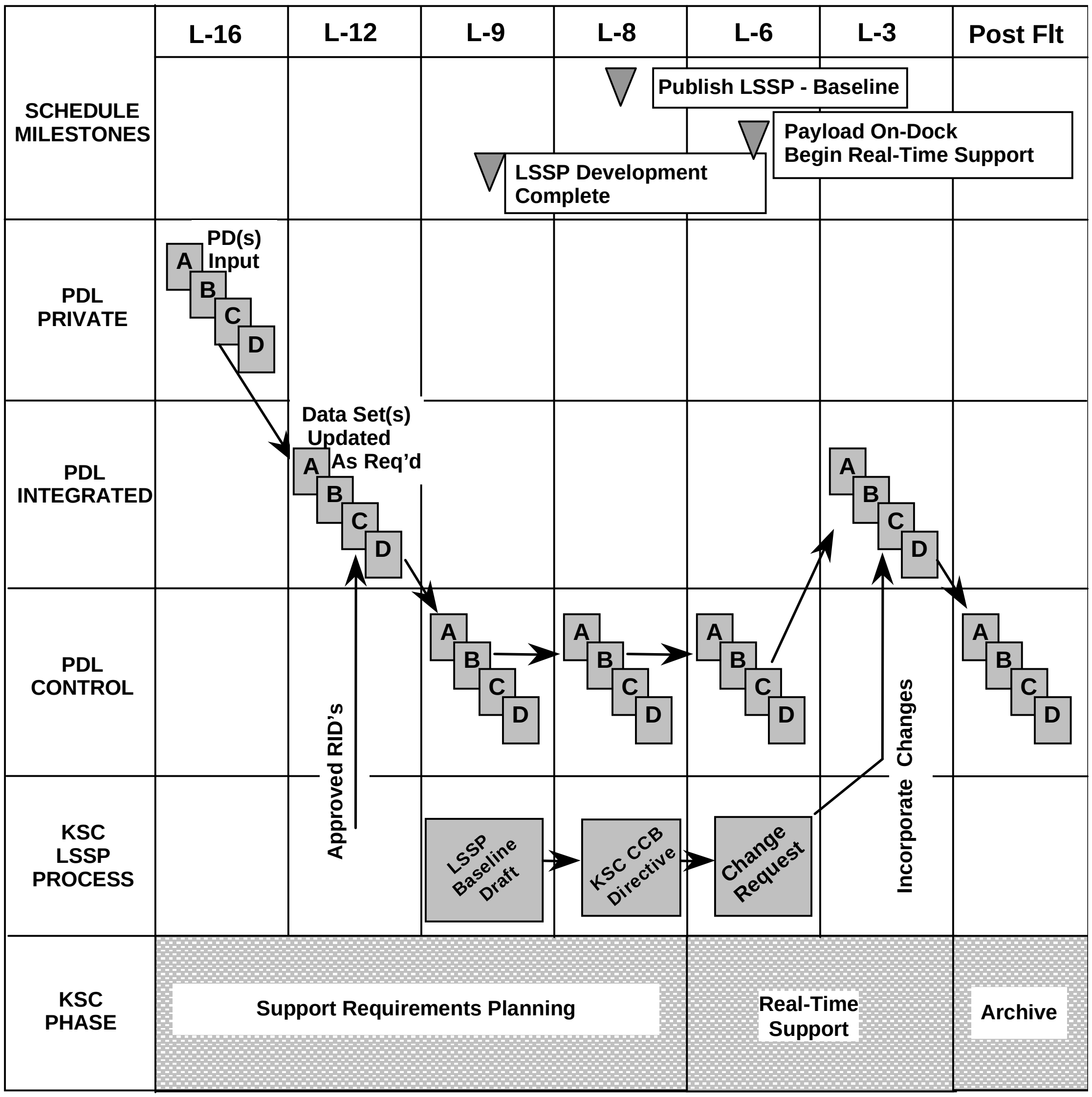
Changes to the Payload Test and Checkout System (PTCS) ground applications software including application software operating on the Test, Checkout, and Monitor System (TCMS), GSE embedded software, the baselined measurement database used by application software and MDM Application Test Environment (MATE) Simulations software is not anticipated. However, if changes are required, the PD needs to identify them in the Support Requirements Data Set of PDL. From the requirements identified in the data set, the CIM will identify a deliverable document, due date and any payload unique cost item. The KSC contact for details on the ground applications software requirements will work with the appropriate systems personnel to input the requirements and coordinate the implementation.

2.3 Operations and Schedule Development Process

2.3.1 Schedule Development Process Overview

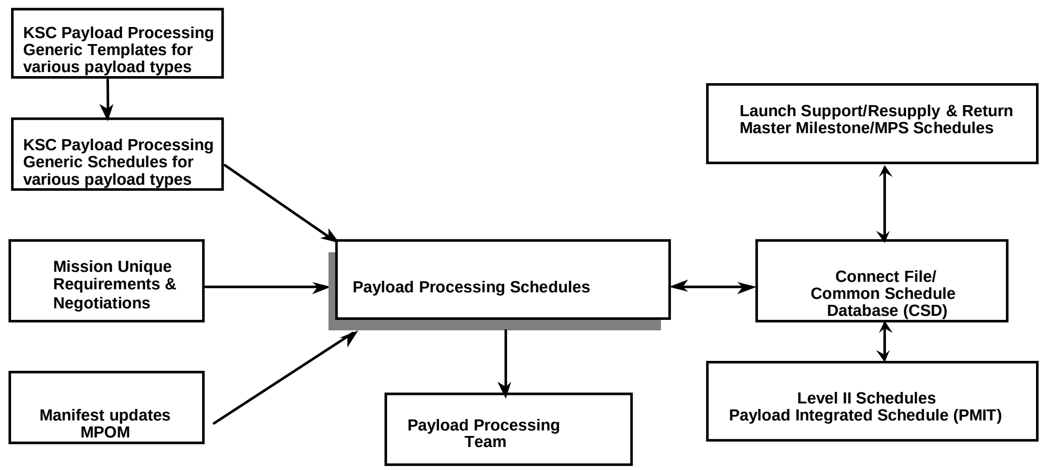
Figure 2.3.1 describes the overall schedule development process that is followed to generate schedule products. The product that is used to plan and track when specific utilization activities occur for each utilization mission is the Payload Processing Schedule (PPS) (see section 2.3.2). Each PPS is developed with inputs from the payload team. The PPS's for each mission are based on the KSC generic payload schedules (see section 2.3.5), which are modified based on the payload complement and the payload requirements as indicated by the Manifest and Multilateral Payload Outfitting Model (MPOM) and mission unique requirements and negotiations.

Figure 2.2.3. Support Requirements Data Set and LSSP Development



The major milestones found in the PPS's are derived from the need dates shown on the Master Milestone and Mission Processing Schedules (see section 2.3.3) generated by and negotiated internally by KSC. The MMS/MPS dates are automatically fed to the PPS's through the integrated KSC level Common Schedule Database (CSD) (see section 2.3.4). A subset of data in the PPS's are also contained in the Program Level CSD and utilized in other non KSC schedules, such as the Level II Program Schedules and the JSC ISS Payload Office Payload Integration Schedules.

Figure 2.3.1. KSC Payload Scheduling Process Overview



2.3.2 Payload Processing Schedules

The PPS's provide task-level information necessary for planning mission specific payload activities and for subsequent input into the Payload Integrated Control Schedule (PICS), which is the work control schedule used to define daily resource allocations. When more detail is necessary for a particular operation, a PPS mini-schedule is generated. Examples of PPS mini-schedules include Testing Mini-Schedules, Middeck Late Stow Schedules, and Middeck Scrub/Turn Around Schedules. The PPS also includes deliverable items which enables a coordination of the timely delivery of hardware and products to KSC. A subset of items on these schedules provide the data for the Common Schedule Database (CSD) networks, both KSC level and Program level.

Payload Processing Schedules are developed and maintained with the appropriate discipline Leads identifying the critical path for their functions. These schedules are coordinated internally at KSC for schedule interfaces and dependencies and with the Shuttle Flight Operations Contractor (SFOC) for middeck operations.

2.3.3 Master Milestone and Mission Processing Schedules

KSC produces the Master Milestone Schedules and the Mission Processing Schedules. The Master Milestone Schedule is a summary level schedule depicting the KSC ground processing activities and milestones for a given mission. The Mission Processing Schedule is task-level information necessary for planning mission specific activities. Payload inputs are coordinated into the Mission Processing Schedules and Master Milestone Schedules.

2.3.4 Common Schedule Database (CSD)

The KSC Space Station integrated scheduling system is comprised of two primary schedule levels. The top level is called the Common Schedule Database (CSD) level and it contains the major milestones and activities that represent KSC's responsibilities to support ISS flights. This level of schedule is submitted to the ISS Program office each week and integrated with the same level of schedule from each of the other Program participants in the ISS Program. These are logically constrained Critical Path Method (CPM) networks that represent the work effort required in order to meet the Program milestones and any interim milestones associated with them. The CSD is under direct authority of the Integrated Schedule Planning Process Document (ISPPD).

The second level of the scheduling system is the KCSD level schedules. The KCSD level schedules serve to monitor the internal KSC interdependencies, thus providing horizontal integration between the teams. These schedules represent the details of the work necessary to accomplish the activities contained in the CSD top level schedules. A subset of schedule items in the PPS's are used in both levels of the CSD.

2.3.5 Generic Schedules and Templates

For each type of item KSC is processing, a generic template is developed. The generic templates are flow charts depicting the overall process that an individual payload type follows at KSC. There are templates for the different types of rack and attached payloads, middecks, stowage, and International Partners payloads. The location of the templates on the Web is defined in Appendix C. The templates are used by the KSC as a communication tool. They also document the current plan for how the different payloads will be processed at KSC.

From the Generic Templates, the Generic Schedules are developed for the applicable payload types. The Generic Schedules (GS) are waterfalls based on time from launch that activities are expected to occur. There are Generic Schedules for the different types of racks and attached payloads, for requirements development, and for a typical MPLM mission. These generic schedules are primarily used as guidelines in developing PPS's.

2.4 Work Authorization Document (WAD) Development Process

Upon definition of a payload configuration, engineers will be assigned to perform physical integration, test, ground systems support, middeck experiment processing, and other tasks. These tasks are performed as defined in a WAD, such as a Test Assembly Procedure. A determination of the WADs required to perform the payload requirements is made and leads to the creation of a WAD development schedule in order to provide adequate review time and meet the operational need dates.

Upon assignment of payload responsibilities, each engineer reviews the applicable engineering products to become familiar with the technical aspects of the payload and to initiate WAD development. The engineer plans his/her WAD development in accordance with the overall schedule. During WAD development the engineer may require procedural inputs from the PD in order to document the steps necessary to perform the WADs intended function. Upon completion of a WAD draft, the WAD will be distributed for review. After incorporation of the comments received, the WAD will be released for use. Depending upon the complexity of the procedure, more than one draft may be required.

Upon release, a Quality Assurance (QA) Record Copy is maintained as the official as-run procedure. Upon completion of the task, the record copy is closed, and filed in the Technical Data Center (TDC).

Most WADs used for processing payload hardware will be Test and Assembly Procedures (TAPs). In some cases, where a faster procedure release is required, a Test Preparation Sheet (TPS) may be used. The types of WADs and the procedures to change the content of WADs are addressed in the applicable Standard Practices and Procedures (SPP) documents.

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SECTION III – OFF-LINE PROCESSING

3.1 General Description

3.1.1 General Processing Areas

Off-Line Processing Areas (OLPA) are flight hardware processing areas dedicated for use by PD during prelaunch and post-landing operations. These rooms are used for pre and post mission processing checkout of middeck experiments, racks, and attached payloads. Hardware problem resolution and troubleshooting in compliance with KSC safety guidelines are performed in OLPA as required to support mission needs.

The processing areas located in the SSPF and O&C conform to the 300K-class clean work area specifications and are access controlled. Off-line areas with access control are established in the SSPF Intermediate Bay and O&C High Bay for payload hardware that is too large to process in OLPA.

There are seventeen SSPF OLPA for general purpose processing, which range in size from 286 ft^2 to 900ft^2 and are adjacent to the Intermediate Bay. Two of these rooms are designed to support chemical processes and two rooms are dark rooms for photographic support.

There are nineteen O&C OLPA rooms for general purpose processing which range in size from 115 ft^2 to 800 ft^2. One laboratory is designed to support chemical processes and one laboratory is designed as a dark room for photographic support.

Off-line processing support required by the PD is coordinated through the KSC CIM.

3.2 Requirements Identification for OLPA

In order to define and document the PD OLPA requirements on KSC, the PD logs on to the Payload Data Library (PDL) and goes to the KSC Support Requirements Data Set. Within that Data Set there is a Facility Support – Offline Processing electronic form to be filled out by the PD for detailed OLPA space needs, as well as service and equipment requirements. Available services and equipment are annotated in this handbook. The KSC CIM is the PDL Data Set Manager for this Data Set and as such, coordinates all OLPA requirements with the PD directly on PDL.

The CIM coordinates with the appropriate KSC service provider and forwards to the LSSP/PRD as required on behalf of the PD ensuring the support meets KSC scheduling requirements.

3.2.1 OLPA Assignments

OLPA requirements are coordinated and rooms, equipment, and requested services are reserved and scheduled. The SSPF/O&C Off-Line Processing Areas Utilization Schedules, as coordinated by the KSC Offline Lab Scheduling Team, reflect the areas assigned to PDs. Operational activities in off-line areas are included in the PICS. Real-time schedule changes are authorized to meet operational constraints.

3.2.2 OLPA Preparations for Payload Processing

To ensure the readiness of OLPA for flight hardware processing, the rooms are thoroughly cleaned prior to payload arrival. Facility maintenance services such as cleaning floors, walls, ceilings; filter replacements; tacky mats; and measurements of temperature, humidity, and particle count are scheduled as required.

To comply with K-STSM-14.2.1, KSC Payload Facility Contamination Control Requirements / Plan, the following standards are required:

- Temperature at 71 +/- 6 degrees F (21.7 +/- 3.3 degrees C)
- Humidity controlled to remain at <60% relative humidity
- Cleanliness level of these processing areas is maintained as a Level 5 Clean Work Area

3.3 Off-line Payload Processing

Off-line processing begins with a pre-off-line briefing led by the CIM. The purpose of the Pre-Off-line Briefing is to familiarize the PD with KSC work policy and work area rules, and to discuss planned activities (both off-line and turnover). Daily Tag-up meetings are held by the CIM as required to discuss PD activities and support requirements for the near term. While the payload is off-line, the following support is available if agreed to in the PDL:

- Post-ship health check
- Fluids support
- Hazardous operations

3.3.1 Access Control

To maintain the integrity of OLPA, access control measures are provided. Access control elements are safeguarding the sub-master key, performing changes to combination locks after the PD vacates, performing periodic combination changes and maintaining a written log of lock combinations at KSC.

A system for integrity control seals and mission assurance control access logs will be used as required to ensure flight hardware configuration.

Integrity and entry control are performed in accordance with KSC Standard Practices and Procedures document, “Integrity And Entry Control”. The PD is briefed on use of the cipher locks installed on all OLPA. The PD determines the combination for their room, which allows the use of a combination that is easy for their team to remember.

3.3.2 Cleanliness

The cleanliness of the processing areas is monitored daily. PDs utilizing the OLPA are introduced to the janitorial staff and briefed on the cleanliness requirements of their area. The daily cleaning of the room is coordinated between the PD and the janitorial staff. This provides minimum impact to the PD’s processing schedule.

3.3.3 Equipment/Material Support

Equipment or services required to support off-line payload operations such as certified soldering, crimping, mass spectrometer leak detection, hazardous operations of various types, and pneumatic tests are available and can be arranged through the PDL support requirements process. Activities are coordinated with KSC to ensure proper support.

Expendable materials required to support payload off-line operations are documented in the LSSP. Solvents, wipes, and other expendable materials are stocked or readily available to the off-line users. Requested items not covered in the LSSP may require a support request and CIM approval. Disposition of biological and hazardous wastes will be coordinated through the OLPA Facility Manager.

Expendable materials are obtained through the PGOC Logistics Support personnel, technician shop, instrument library, and other areas as required. PDs are reminded that early notification of the need for expendable items, not already requested in the LSSP, will improve their chances of receiving the items without impacting their processing schedule.

New real-time requirements for equipment or services can be requested through the CIM or OLPA Facility Manager. Significant items require CIM approval, and update to the SRDS. All facility cranes in the SSPF, whether High Bay or Intermediate Bay, regardless of on-line or off-line status, shall be operated by certified KSC personnel. Most OLL are outfitted with either one- or two-ton load-bearing ceiling hooks to accommodate hoisting operations, which may be performed by the PI with KSC Ground Safety concurrence.

3.3.4 Outages

All facility outages that affect the off-line processing areas are tracked. PDs that would be affected are notified of any outages in their processing area. Outages are approved only after receiving concurrence from the PD using the area affected by the outage.

3.3.5 Middeck Experiment Unique Off-line Processing

Middeck offline processing includes various fit checks and hardware inspections in the offline processing area. The flight cable is obtained and a fit check of the flight cable to the middeck experiment is performed by KSC. KSC also performs bonding checks as required. If the experiment requires a Payload Mounting Panel (PMP) to be installed on to it, KSC performs the PMP installation. KSC also coordinates sharp edge inspections of the middeck experiments with a flight crew representative.

3.4 Unassigned OLPA Maintenance

3.4.1 Facility Maintenance

OLPA are prepared and equipped to maintain readiness and availability to support flight hardware operations. Daily, weekly, quarterly, and annual preventive maintenance activities necessary to maintain the OLPA at design specification are scheduled.

Walk-downs of each off-line area are performed once every week. Conditions and trends that constrain maintaining the off-line operational capability are tracked and identified. Resolution is coordinated with the responsible organizations and reported when resolved.

Upon departure of the experiment, OLPA are thoroughly cleaned and waste products are disposed of using the appropriate guidelines defined in the KSC Standard Practices and Procedures documents.

3.4.2 Test Equipment Maintenance and Calibration

Services are provided to maintain and calibrate mechanical and electrical test equipment including support to items in the Repeatable Maintenance Recall System (RMRS). This equipment includes voltmeters, oscilloscopes, scales, balances, meters, power supplies, laminar flow benches, and analytical equipment of various types maintained or kept in the off-line areas. Property Custodian functions are performed to provide property control of the off-line test equipment. Equipment requiring periodic calibration or functional certification are maintained through the Repeatable Maintenance Recall System (RMRS).

3.5 Specialized Science Processing

Payloads with biological or unique research objectives can be supported through the KSC Life Sciences Support Facilities in Hangar L, the O&C Building, the SSPF, and the PSSF and PRF at Dryden Flight Research Center (DFRC), the secondary landing site.

Through the authority of the KSC CIM, the Life Sciences Support Contractor (LSSC) coordinates and implements technical and logistical requirements for assigned payloads. These requirements are submitted by the experiment PD and reviewed on-site by KSC representatives for compliance with applicable NASA, federal, state, and local agency restrictions and guidelines. In fulfilling these requirements, KSC supports safety compliance, functional verification of support equipment, biological specimen care, and licensed or certified logistics for inbound and outbound shipments of biological materials, chemical components, hardware / GSE, and hazardous waste disposal. The KSC CIM must give final approval of all submitted documentation prior to PD arrival so that payload activities can commence.

To facilitate communications between all parties, regular meetings between the PD team and the CIM/KSC support representatives will be held throughout PD stay at KSC facilities. These meetings will serve to update all parties on the mission status and provide a vehicle for amending support requirements and timeframes to meet any mission schedule modifications and maintain mission-readiness timelines.

3.5.1 Preparations for Arrival

3.5.1.1 Identification and Presentation of OLPA Requirements

Once manifested, the PD can enter their science and hardware requirements on the “KSC Payload Data Library” available on the Internet site (http://pdl.msfc.hosc.nasa.gov/). PD-listed requirements should contain detailed information such as laboratory size and specific experimental needs.

These requirements should define special details including restricted access, chemical, radioactive, biohazardous support, equipment descriptions, expendables / supplies information, special environmental requirements (e.g. temperature, lighting, air exchange rates, and etc.), and hazardous operations or safety support. The PD should include the timeframe of operations to include the start and completion dates, as well as payload duration and launch/landing-dictated constraints (i.e. time, resources, and etc.) for each requested support requirement. Complete instructions for entering support requirements in PDL are found in Section 7 of SSP 52000-PDS, *The Payload Data Sets Blank Book*.

3.5.1.2 Offline Laboratory Assignments & Use of the Specialized Science Support Facilities

The LSSC will review, assess, analyze, and coordinate PD requirements for all payloads requiring specialized science support and will be responsible for the final scheduling of appropriate space, equipment, and services. If conflicting requirements are identified, the PD and the LSSC will coordinate alternative support arrangements to best meet the critical needs of all payloads.

3.5.1.3 Pre-arrival Laboratory Preparations

Applicable requirements identified in the “KSC Payload Data Library” are collected for inclusion and conversion to the Ground Support Requirements Document (GSRD), which is an addendum to Annex 8 of the PIP. Specific information on specialized payload requirements (i.e., specific vendor catalog numbers for expendables/ supplies, chemical, and equipment) are presented in the GSRD and will be used for procurement and verification of support capabilities. Designated laboratory space for each payload component is also derived from these documented requirements prior to PD arrival.

3.5.2 Preflight Operations

PD team personnel will be given a KSC customer orientation briefing upon arrival at KSC. This briefing covers federal, state, NASA, local regulations and guide-lines for payload processing, and safety information relative to facility use and specific PD operations. To ensure proper fulfillment of PD-requested support, a laboratory examination will commence to determine proper accommodation and configuration. If required, the staff can provide specialized training for any assigned equipment or unusual facility capabilities, use, and / or procedures.

3.5.2.1 Payload Hardware Testing and Checkout

Following the delivery of flight hardware, the PD is responsible for verification of hardware flight readiness and any functional testing to ensure no damage occurred during shipment. The LSSC can provide certified technical support for these operations, as well as hardware troubleshooting expertise, if necessary.

3.5.2.2 Integration

Integration is the merging of experimental components with flight hardware. Passive payloads, which do not contain time or temperature sensitive materials, may be integrated far in advance of launch. However, most life science payloads, especially those with live biological specimens, often require extensive and specialized environmental support optimized by late integration in the pre-launch processing timeline. Late integration generally occurs from 72 to 17.5 hours pre-launch. The PD will prepare all flight samples so that integration can be completed in time for late access turnover (the process of collecting the payload and delivering to the Shuttle for installation).

3.5.3 Inflight Operations

While a payload is inflight, ground control specimens and parallel experimentation can be accommodated at KSC. Science and technical support is available and includes specimen husbandry, inflight experimental monitoring, and setup/maintenance of the Orbiter Environmental Simulator (OES) for ground control operations. In addition, preparations for postlanding activities at KSC and the secondary landing site at DFRC are finalized during the mission inflight time. All requested support services of such operations should be identified in the SRDS prior to payload arrival on-site.

3.5.3.1 Ground Control Experiments

Ground control experiments can be conducted to compare results with space-based experiments. Payloads that are sensitive to changes in humidity, temperature, carbon dioxide, and oxygen levels during flight can be maintained in a specialized environmental chamber that mimics actual on-orbit conditions. Station environmental data can be downlinked to the OES so that constant adjustments to the chamber environment can be provided to the PD. Near real-time adjustments can also be made to the ground control hardware outside the OES and payload recovery protocols can be supported. Ground control experiments can be performed concurrently with the mission or asynchronously, with several payloads co-sharing the OES on a given mission.

3.5.3.2 Payload Monitoring

The Experiments Monitoring Area (EMA) is located in the LSSF, adjacent to the science laboratories. The PD can submit a support requirement via the PDL for use of the EMA to monitor flight data, video, and audio downlink and/or to monitor active voice loops during the mission. KSC support personnel can verify these links and support PD monitoring requirements.

3.5.4 Postflight Operations

Science and technical support is provided to the PD following landing activities. Requirements for this support should be outlined, reviewed, and approved through the SRDS/LSSP process. Postflight activities such as specimen data collection, payload manipulations, troubleshooting, and final shipment of samples to customer laboratories are supportable to a limited extent by KSC.

Postflight science support operations at the secondary landing site are limited to more basic procedures due to the facility limitations at DRFC. Operations such as packing and shipment of payload hardware back to KSC for full de-integration or simple sample recovery (e.g. retrieval of samples from flight freezer) can be supported at these facilities. Any operational support at the secondary landing site must be identified prior to PD arrival at KSC for preflight operations and requested in the PDL KSC Support Requirements Data Set.

3.5.4.1 Postflight Analysis

Laboratory areas and facilities are assigned to the PD through the duration of their postflight analysis operations. These activities include the completion of experimental procedures or stabilizing of specimens for transfer. A timeline for all operations is provided in the PDL prior to commencement of on-site operations. Unavoidable extensions are available and are worked on a case-by-case basis and should be annotated in the PDL.

3.5.4.2 Laboratory Clearance

After all operations have concluded, the PD is required to clear and clean their assigned work area. This includes proper labeling of all waste products and materials, verification of log entries, inventory and cleaning of facility equipment, return of excess chemicals and expendables/ supplies to the LSSC. Other payload closeout activities include logistical arrangements for shipments of hardware, equipment, biospecimens, and other items brought to KSC by the PD, and closeout of all protocols and safety issues. A final laboratory inspection by the PD and the LSSC will provide closure of all equipment loan, safety compliance, and operational issues prior to PD departure.

3.5.4.3 Shipping Logistical Support

Payloads may request KSC assistance to arrange domestic and international shipping of support GSE, hardware, equipment, samples, and expendables to and from KSC. These requests should be detailed in the PDL for each item, and a KSC Form 7-248, *Request for Shipping Document*, is also required at the time of shipment. The PD and the LSSC will work together to ensure all necessary shipping documents and disclosure statements are completed on these shipments to comply with NASA, OSHA, DOT, US Customs, and all federal, state, and local agencies requirements. Shipments of viable specimens, potentially hazardous materials or environmentally sensitive materials are done in strict accordance with NASA safety regulations and quality assurance procedures. The LSSC will coordinate all PD shipping activities with NASA Transportation.

SECTION IV -- HARDWARE RECEIVING AT KSC

4.1 General Description

This section gives an overview of the International Space Station (ISS) and Payload Processing Directorate's Logistics Division services and support. The Logistics function performs integration activities when receiving an item at KSC. Basic Logistics functions are documented in K-SS-12.10, *Station Logistics Capabilities Plan*, and specific forms and technical information are documented in the K-SS-12.17, *ISS & Payloads Receiving and Shipping Guideline*.

Property is tracked, inventoried, stored or turned over when in conformance with NASA KSC and ISSP requirement documents and if applicable accepted by the Sustaining Engineering and Quality Assurance organizations.

4.2 Equipment

The integrated receiving and inspection of an equipment item arriving at KSC may require the use of a forklift or crane during the unpacking operations and is generally documented in the program requirements document (PRD) mission unique SRDS/LSSP.

Cargo Transfer Bags (CTBs) and divider inserts, and Rack Handling Adapters (RHA) and RHA bases, are scheduled by Fleet Resource Management (FRM) to support flight crew and ground operations. They are also maintained and stocked for re-use at KSC.

4.3 Receiving & Inspection

Receiving verifies shipping documentation is satisfactory. Receiving notifies Quality Engineering of the arrival of flight or non-flight equipment items and if applicable to a mission the Depot Mission Representatives are also notified.

Receiving personnel will review the unique requirements accompanying such items to coordinate with other support functions such as quality-configuration management, property, warehousing, database administrators, etc.

The ISSP Fleet Resource Management (FRM) function, led by the NASA Logistics & Maintenance Office at JSC is managed by the KSC Logistics Division. FRM schedules the usage periods of Rack Handling Adapters (RHAs) required to support racks during rack build up, rack transportation, and rack ground processing and integration activities at required locations. The RHA assembly consists of two units, an upper structure and one of two different bases, i.e., a MSFC Base or an SSPF Base. The SSPF Base is required to interface with the United States ISPR Checkout Unit (USICU). FRM schedules the use of this ground support equipment per the SSP 50110, Multi Increment Manifest Document (MIM) current issue. Manifested items are then scheduled for support in accordance with real time processing ground rules. If an item requires use of an RHA during a pre-launch or post-landing time frame that is out of scope of the manifested processing flow then the KSC FRM Logistics Division should be contacted.

FRM also schedules the Rack Shipping Containers (RSCs) for the transport of racks. An RSC and upper structure must be used to ship a configured rack. The base (SSPF or MSFC) must be shipped separately when a rack and RSC is shipped to a new location. This is required to enable the receiving personnel to de-integrate the rack from the RSC thereby, making the RSC available for another user. Valuable transportation information is also available in the K-SS-12.11 Station On-Site Oversized Element Transportation Logistics Plan.

SECTION V – FLIGHT HARDWARE TURNOVER

5.1 General Description

After off-line operations are complete, the PD flight hardware is ready for formal turnover to KSC custody. KSC performs a thorough review of the flight hardware and related Integration Data Package (IDP). A formal turnover is performed and after turnover, KSC has custodial responsibility for the PD flight hardware. Unless PD GSE such as integration slings, hoisting and handling adapters, and special tools is identified in the IDP as a requirement for integration, the PD GSE is usually not turned over to KSC. Calibrated PD provided GSE shall be turned over with a valid calibration for the duration of processing.

5.2 Turnover Activities

As part of Turnover, hardware undergoes Receiving and Inspection, as described in Section 4.3.

The PD must have their Integration Data Package (IDP) ready and delivered for review by KSC approximately 1 week prior to turnover. See SSP 52000-PDS, *Payload Data Sets Blank Book*, for IDP content. The KSC team is notified that the IDP is available for review. The Quality Engineer (QE) performs a review of the IDP to check that all applicable IDP items are addressed and are complete and identifies any concerns to the TIM. Safety verifies that all hazardous materials have been declared, and that the Material Safety Data Sheets are included in turnover package or have been received by safety. Safety also verifies that any special operational instructions pertaining to hazardous materials are included in the turnover package. Upon KSC team review, the PD is assisted in resolving issues or problems with the IDP.

A pre-turnover inspection of the PD hardware is coordinated with all engineering disciplines participating with Quality Assurance (QA), configuration management, and Logistics in the inspection of all applicable items being turned over to KSC a day prior to turnover. All applicable materials and articles being turned over to KSC are verified per pre-planned Special Inspection Checklist. Non-conforming articles are identified and documented during the Pre-Turnover Inspection on the Pre-Turnover Inspection Checklist, and integrity control of the experiment is established after completion of the inspection. See the “Experiment Hardware Handling Guide” for the Pre-turnover Inspection Checklist. Discrepancies that can be worked by KSC after turnover or by the PD prior to turnover are negotiated between the PD and KSC. The PD updates the IDP after the identified discrepancies have been resolved, or addresses items with KSC as required.

The pre-turnover inspection is followed by the Turnover Meeting and a Turnover Certificate is prepared. The team discusses open IDP items/issues/non-conformances documented on the Pre-Turnover Inspection Checklist. At the end of the meeting the Turnover Certificate is signed by the TIM and PD. The certificate is filed in the original IDP. The original record copy of the IDP is filed and maintained by KSC until return to the PD.

5.3 Middeck Experiment Unique Turnover Activity

For middeck experiments all of the above turnover activities apply, with the following exceptions. The IDP review occurs one day prior to turnover, with hardware inspection and turnover occurring on the same day of and just prior to Orbiter integration. For missions with numerous middeck experiments, IDP reviews may begin approximately three days prior to turnover.

SECTION VI – PHYSICAL INTEGRATION AND CLOSEOUTS

6.1 General Description

Physical integration (if required) begins after the formal turnover of hardware to KSC. After turnover of the rack, EXPRESS payload, or attached payload, it is moved from the off-line lab/area to the Intermediate Bay for physical integration. Physical integration encompasses all operations required to assemble and prepare a payload rack, attached payload, or middeck experiment for test and checkout, and prelaunch operations. Physical integration includes all of the following activities: payload integration, air flow balancing, fluid system leak checks, payload stowage, payload closeouts, and payload servicing/maintenance. This section covers all of the physical integration activities that occur in the SSPF (or Hangar L for some middeck experiments) prior to integration with the overall Station carrier or with the Orbiter.

6.2 Equipment

Various GSE is used by KSC during the process of physical integration in the SSPF. Rack GSE includes rack access stands, rack drawer handler, drawer delivery cart, avionics air flow balancing kit, helium mass spectrometer leak detector, portable vacuum pumps, and the Internal Thermal Control System (ITCS) water servicing unit. While not in the MPLM, racks are installed in a rack handling adapter (RHA). Those racks that interface with the USICU are integrated in a RHA upper structure assembly with a KSC SSPF base assembly, in accordance with FRM Guidelines/Groundrules documented in the K-SS-12.15 FRM Plan. Attached Payload GSE includes the EXPRESS Pallet simulator, attached payload adapter sling, and generic slings/web straps/shackles. Unique GSE that is required to handle a payload/experiment is to be provided by the PD.

KSC Middeck experiment GSE includes the middeck weight and center of gravity table, batteries, battery chargers, power control boxes and cables, cradles, transportation boxes, covers, and experiment transport vans. Some Middeck GSE is stored and maintained at Dryden Flight Research Center for alternate landing site support.

6.3 Payload Stowage

Physical integration includes payload passive stowage integration into stowage trays/racks. Payload stowage items are turned over to KSC for packing into dedicated payload trays, and mixed payload trays which contain items from more than one payload. After turnover to KSC or after integration, dedicated trays and mixed payload trays are put into a drawer delivery cart and taken to the R&R Rack Integration Room for a crew drawer bench review. Applicable trays are then transferred for installation into the stowage rack.

6.4 Payload Classes

6.4.1 Facility Class Payload Rack

Facility Class Payload Racks are integrated by the PD prior to rack turnover to KSC. Following turnover of the rack to KSC, Facility Class payload racks that have been serviced by the PD and have a certification showing compliance with Space Station water specifications need no further servicing prior to connection to the USICU. Racks turned over to KSC empty are individually serviced (flushed/evacuated/filled) using the ITCS Servicing Unit (SU). A water sample is taken from the SU following ITCS servicing to verify compliance with Space Station cooling water specifications before the rack is connected to USICU. Racks serviced by the PD and turned over to KSC without a water certification are drained and reserviced (evacuated/filled/sampled) prior to connection to the USICU. Continuity/isolation checks, which are a payload/rack cable pre-power checkout, are performed, after which the rack is moved from the rack integration area to the USICU. The rack is positioned at USICU, the rack umbilicals are connected to the USICU utility interface panel, and payload testing is then performed.

After payload testing, the rack umbilicals are demated from USICU and the rack is rolled away from USICU and back to the rack integration area. Rack closeouts are then performed. If required, stowage trays are installed into the rack. Closeouts include a final inspection of the rack to search for any anomalies before the rack is installed into the MPLM. The internal sections of the rack are inspected for any anomalies and closeout photos are taken before closeout panel installation, if closeout panels had been previously removed. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. If previously removed, closeout panels are installed onto the rack. A rack sharp edge inspection and final closeout is performed to inspect the rack for any sharp areas that could injure the crew. The rack is inspected to ensure it meets cleanliness requirements. Closeout photos are taken. The rack is then transferred for weight and CG operations and installation into the MPLM.

6.4.2 EXPRESS Rack

6.4.2.1 EXPRESS Rack Initial Flight

The EXPRESS Flight Rack is staged prior to turnover to KSC. Following turnover of the EXPRESS Flight Rack and EXPRESS payloads to KSC, the payloads are installed into the EXPRESS Flight Rack. This operation involves installing the payloads into the flight rack and connecting all water, gas, vacuum, power, avionics air, and data interfaces. The rack drawer handler may be used for installation of payload that cannot be easily installed by two technicians.

Payload fluid line leak checks of KSC-assembled joints are performed. Joints having an excessive leak rate are repaired. EXPRESS Racks and EXPRESS payloads that have been serviced by the PD prior to Turnover and have a certification showing compliance with ISS water specifications need no further servicing prior to integration. EXPRESS Racks and EXPRESS payloads turned over to KSC empty are serviced (flushed/evacuated/filled) using the ITCS Servicing Unit (SU). A water sample is taken from the SU following ITCS servicing to verify compliance with ISS cooling water specifications before the integrated rack is connected to USICU. Continuity/isolation checks are performed, and then the rack is moved from the rack integration area to the USICU. The rack is positioned at the USICU and the rack umbilicals are connected to the USICU utility interface panel. EXPRESS Rack and payload testing are then performed.

After EXPRESS rack and payload testing, the rack umbilicals are demated from USICU and the rack is rolled away from USICU and back to the rack integration area. Rack closeouts are then performed. If required, stowage trays are installed into the rack. Closeouts include a final inspection of the rack to search for any anomalies before the rack is installed into the MPLM. The internal sections of the rack are inspected for any anomalies and closeout photos are taken before closeout panel installation, if closeout panels had been previously removed. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. If previously removed, closeout panels are installed onto the rack. A rack sharp edge inspection and final closeout is performed to inspect the rack for any sharp areas that could injure the crew. The rack is inspected to ensure it meets cleanliness requirements. Closeout photos are taken. The rack is then transferred for weight and CG operations and installation into the MPLM.

6.4.2.2 EXPRESS Rack Resupply Flight

The EXPRESS Transportation Rack is staged prior to its turnover to KSC. After turnover of the EXPRESS resupply payloads to KSC, payloads that have been serviced by the PD and have a certification showing compliance with Space Station water specifications need no further servicing prior to integration into the EXPRESS Functional Checkout Unit (FCU). Payloads turned over to KSC empty are individually serviced (flushed/evacuated/filled) using the ITCS Servicing Unit (SU). A water sample is taken from the SU following ITCS servicing to verify compliance with Space Station cooling water specifications before the payload is integrated into the EXPRESS FCU. Payloads serviced by the PD and turned over to KSC without a water certification are drained and reserviced (evacuated/ filled/sampled) prior to integration into the EXPRESS FCU. The payloads are then installed into the EXPRESS FCU and all water, purge gas, vacuum, power, avionics air, and data interfaces are connected. The rack drawer handler may be used for installation of payloads that cannot be easily installed by two technicians. Continuity/isolation checks are performed, and then payload testing is then performed as described in Section VIII.

After testing, the payloads are disconnected from the EXPRESS FCU interfaces removed from the rack. The payloads are then installed into the flight Transportation Rack. Rack closeouts are then performed. If required, stowage trays are installed into the rack. Closeouts include a final inspection of the rack to search for any anomalies before the rack is installed into the MPLM. The internal sections of the rack are inspected for any anomalies and closeout photos are taken before closeout panel installation, if closeout panels had been previously removed. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. If previously removed, closeout panels are installed onto the rack. A rack sharp edge inspection and final closeout is performed to inspect the rack for any sharp areas that could injure the crew. The rack is inspected to ensure it meets cleanliness requirements. Closeout photos are taken. The rack is then transferred for weight and CG operations and installation into the MPLM.

6.4.3 Minus Eighty Degree Laboratory Freezer for ISS (MELFI) Rack

The MELFI Rack will be integrated by the PD prior to rack turnover to KSC for the initial flight and will be integrated at the beginning of each mission flow. Following turnover from the PD for the initial flight, the rack servicing and sampling scenario is the same as that for the Facility Class Payload Rack. At the beginning of each mission flow, the rack is inspected to ensure the rack has no damage. Following mission assignment, the MELFI rack is individually serviced (evacuated/filled) using the ITCS Servicing Unit (SU). A water sample is taken from the SU following ITCS servicing to verify compliance with Space Station cooling water specifications before the rack is attached to the USICU. Continuity/isolation checks, which are a payload/rack cable pre-power checkout, are performed, and then the rack is moved from the rack integration area to the USICU. The rack is positioned at the USICU and the rack umbilicals are connected to the USICU utility interface panel. Payload testing is then performed.

After rack testing, the rack umbilicals are demated from the USICU, and the rack is rolled away from the USICU and back to the rack integration area. Rack closeouts are then performed. If required, stowage trays are installed into the rack. Closeouts include a final inspection of the rack to search for any anomalies before the rack is installed into the MPLM. The internal sections of the rack are inspected for any anomalies and closeout photos are taken before closeout panel installation, if closeout panels had been previously removed. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. If previously removed, closeout panels are installed onto the rack. A rack sharp edge inspection and final closeout is performed to inspect the rack for any sharp areas that could injure the crew. The rack is inspected to ensure it meets cleanliness requirements. Closeout photos are taken. The rack is then transferred for weight and CG operations and installation into the MPLM.

6.4.4 Lab Support Equipment (LSE) Transportation Rack (LSE TRACK)

The LSE TRACK is staged prior to its turnover to KSC. Following turnover from the PD for the initial flight, the rack servicing and sampling scenario is the same as that for the Facility Class Payload Rack. The Cryogenic Storage Freezer (CSF) will already be installed in the rack at the beginning of each mission flow. Following mission assignment of the LSE TRACK the rack will be treated the same as a Facility Class Payload Rack. At the beginning of each mission flow, the rack is inspected to ensure the rack has no damage. The rack is serviced (evacuated/filled) using the ITCS Servicing Unit (SU). A water sample is taken from the SU following ITCS servicing to verify compliance with Space Station cooling water specifications before the rack is attached to the USICU. Continuity/isolation checks, which are payload/rack cable pre-power checkout, are performed, and then the rack is moved from the rack integration area to the USICU. The rack is positioned at USICU and the rack umbilicals are connected to the USICU utility interface panel. Payload testing is then performed.

The remaining portion of the LSE TRACK consists entirely of International Subrack Interface Standard (ISIS) drawer locations. These locations will be treated in the same manner as an EXPRESS transportation rack as specified in section 6.4.2.2.

After the payloads are installed into the LSE TRACK, rack closeouts are then performed. If required, stowage trays are installed into the rack. Closeouts include a final inspection of the rack to search for any anomalies before the rack is installed into the MPLM. The internal sections of the rack are inspected for any anomalies and closeout photos are taken before closeout panel installation. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. If previously removed, closeout panels are installed onto the rack. A rack sharp edge inspection and final closeout is performed to inspect the rack for any sharp areas that could injure the crew. The rack is inspected to ensure it meets cleanliness requirements. Closeout photos are taken. The rack is then transferred for weight and CG operations and installation into the MPLM.

6.4.5 Truss Attached Payloads

Truss Attached Payloads will be integrated by the PD prior to turnover to KSC. After turnover of the payload to KSC, the payload is installed into a Cargo Element Work Stand (CEWS) for test and checkout activities. Continuity and isolation checks of payload cable harnesses are performed. The Active Common Attach System (ACAS) simulator is mated to the Attached payload, and then payload testing is performed as described in Section VII.

After testing, the ACAS simulator is demated from the attached payload. Payload servicing and closeouts are then performed. Payload fluid servicing operations include payload hardware inert/dry gas purging or cryogenic servicing operations. Multi-layer insulation (MLI) closeouts are installed onto the payload and payload preparations for launch (cover removals, etc.) are performed.

Closeout inspections are performed. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. The inspections include checking the payload for any sharp areas that could injure the crew. There is also an inspection of the payload to search for any anomalies. The payload is inspected to ensure it meets cleanliness requirements. Closeout photos are taken, and the attached payload is transferred for weight and CG operations and installation into the canister.

6.4.6 EXPRESS Pallet

6.4.6.1 EXPRESS Pallet Initial Flight

The EXPRESS Pallet will be staged prior to turnover to KSC. After receiving and inspection, the EXPRESS Pallet will be installed into a CEWS for integration, test, and checkout activities. After turnover of the payload to KSC, the payload/carriers are installed onto the adapters/pallet. Electrical connections between the payload/adapters and the pallet are accomplished via a mechanical driver during the installations. Continuity and isolation checks of pallet and payload cable harnesses are performed. The ACAS simulator is mated to the Attached payload/EXPRESS pallet, and then pallet and payload testing are then performed as described in Section VII.

After testing, the ACAS simulator is demated from the Attached Payload/ EXPRESS Pallet. Payload servicing and closeouts are then performed. Payload fluid servicing operations include payload hardware inert/dry gas purging or cryogenic servicing operations. Multi-layer insulation (MLI) closeouts are installed onto the payload and payload preparations for launch (cover removals, etc.) are performed.

Closeout inspections are performed. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. The inspections include checking the EXPRESS Pallet and payload for any sharp areas that could injure the crew. There is also an inspection of the EXPRESS Pallet and payload to search for any anomalies. The EXPRESS Pallet and payload are inspected to ensure they meet cleanliness requirements. Closeout photos are taken. The EXPRESS Pallet is transferred for weight and CG operations and installation into the canister.

6.4.6.2 EXPRESS Pallet Resupply Flight

After the payloads are turned over to KSC, the payload/carriers are installed onto the adapters, if required. Continuity and isolation checks of pallet and payload cable harnesses are performed. The EXPRESS payload/adapters are installed onto the EXPRESS Pallet simulator for test and checkout activities. Electrical connections between the payload/adapters and the EXPRESS Pallet simulator are accomplished via a mechanical driver during the installations, and payload testing is then performed as described in Section VII.

After testing, payload servicing and closeouts are then performed. Payload fluid servicing operations include payload hardware inert/dry gas purging or cryogenic servicing operations. Multi-layer insulation (MLI) closeouts are installed onto the payload and payload preparations for launch (cover removals, etc.) are performed.

Closeout inspections are performed. KSC also checks the red streamer log for installed and removed items and checks the connect/disconnect log. The inspections include checking the payload for any sharp areas that could injure the crew. There is also an inspection of the payload to search for any anomalies. The payloads are inspected to ensure they meet cleanliness requirements. Closeout photos are taken. The EXPRESS payload/adapters are removed from the EXPRESS Pallet simulator. The payload/adapters are transferred for weight and CG operations and installation onto the carrier (if required) and/or installation into the canister.

6.4.7 Middeck Experiments

This section describes the various middeck experiment activities that take place prior to the final Orbiter integrated operations at the launch pad. Orbiter integrated activities are discussed in detail in Section X. Also, see Section 3.4.5 for activities that occur during middeck experiment off-line processing.

Payloads that have an envelope exceedance to the NSTS 21000-IDD-MDK dimensions (y or z axis), double-size payloads in previously unused locations, or payloads that have new Orbiter interfaces, should be fit checked in the Orbiter crew compartment in their manifested location. The requirement for a fit check will be determined by SSP, KSC, and payload representatives. Fit checks are performed during Orbiter operations in the Orbiter Processing Facility (OPF) at approximately two months before launch.

EXPRESS payloads that fly in the Orbiter middeck undergo payload testing in the EXPRESS Functional Checkout Unit (FCU). Testing is performed while payloads are at KSC for Orbiter fit checks (or earlier). Payload testing is described in Section VII.

The PD to KSC turnover times for middeck experiments are typically 1.5 to 2 hours, but no more than 4 hours, prior to installation into the Orbiter to accommodate KSC preparation and transportation to the launch pad. After turnover for flight of middeck experiments to KSC, KSC performs all of the preparations and the transport to the Pad. The middeck experiments are cleaned, weight and center of gravity is determined (if required), and the experiments are covered for transport. In some cases the weight and CG data provided at turnover by the PD may be used in lieu of KSC performing weight and CG operations. Experiments that require near-continuous power are switched over from facility power to battery power. The experiments are covered to maintain cleanliness and installed in a transportation box. Experiments that require a vertical orientation are installed into a cradle prior to installation into the transportation box. An experiment transport van is then used to transport several middeck experiments to the Pad.

SECTION VII – TEST AND CHECKOUT OPERATIONS

7.1 General Description

Test and checkout planning and operations begin before the payload arrives at KSC and continues through on-dock arrival, integration into the appropriate ISS carrier, powered payload testing and post-test activities. In particular, this involves (1) the preparation for power-on testing, (2) the power-on test operations, and (3) post-test activities. Pre-test preparation includes configuration and check out of Payload Test and Checkout System (PTCS), User/Control Room, payload, and Ground Support Equipment (GSE). Also, any required electrical cable checks are performed prior to powered test operations. After all preparations are complete, the PTCS and payload are activated to satisfy test requirements and objectives. Post-test securing involves power down and reconfiguration of the payload, PTCS, GSE and Control/User Rooms.

7.2 Pre-test Preparations

Pre-test activities are performed ensure that everything is properly configured and ready to support payload testing, before power is applied to the flight hardware. These activities include preparations of the PTCS, KSC unique GSE, user room, payload, and power cables.

7.2.1 Payload Test and Checkout Systems (PTCS)

The primary purpose of the PTCS is to perform final function interface testing to ensure compatibility between ISS and the Payload.

Prior to the start of testing for a particular payload, PTCS subsystem leads prepare their respective systems (C&DH, C&T High Rate, C&T Video, TCMS, POIC-KSC, power, and fluids) to support powered operations. System hardware and software are uniquely configured for the mission. The latest available revisions of flight software and other data products are installed and configured on their associated systems. An Operational Readiness Test (ORT) of the entire PTCS is performed to confirm that the complete assemblage is fully operational and ready to support payload testing.

7.2.2 Unique GSE

Unique GSE is additional equipment required to provide a simulated interface to the EXPRESS Rack, EXPRESS Pallet and Attached Payload classes of payloads. These include the EXPRESS Rack Functional Checkout Unit (FCU), the EXPRESS Pallet Simulator, and the ACAS simulator. This hardware is configured and checked out as required to support payload testing.

7.2.2.1 EXPRESS Rack Functional Checkout Unit (FCU)

The EXPRESS Rack FCU is a ground version of the flight EXPRESS rack. An ORT on the EXPRESS Rack FCU is performed prior to integration of the payloads for testing. The EXPRESS Rack FCU ORT verifies that all services such as power, TCS, video, command, data, vacuum, and gases are ready to support payload testing. Preparations include ensuring that the EXPRESS PCS equivalent is properly mated to the EXPRESS Rack, and verifying that the proper software is available to be loaded. Also any front panel connections for Vacuum and Nitrogen Gas will be verified.

7.2.2.2 EXPRESS Pallet Simulator

The EXPRESS Pallet Simulator provides a structural and functional interface to the EXPRESS Pallet class of Attached Payloads. The EXPRESS Pallet Simulator contains a pallet controller and power distribution unit. An ORT on the EXPRESS Pallet Simulator is performed to verify all the simulator subsystems are operational prior to the payload/adapter plate installation.

7.2.2.3 Active Common Attach System (ACAS) Simulator

The Active Common Attach System Simulator includes the Unpressurized Mating Adapter (UMA), the Berthing Port Interface Simulator, and supporting GSE. The PTCS services from Power and Fluids subsystems, Communications and Tracking (C&T) High Rate, C&T Video, Command and Data Handling (C&DH), TCMS, and Payload Operations Integration Center at KSC (POIC-KSC) are connected to the ACAS simulator, allowing testing of Attached Payloads. An ORT on the ACAS simulator is performed prior to payload installation and cable connections.

7.2.3 User Room

The user room is used by the PD and the test team to perform and monitor payload test operations. A schedule for the user room is maintained based on documented support requirements.

The user rooms have the following systems and services available to serve the needs of the test team members and PDs:

- TCMS terminals
- Fiber Distributed Data Interface (FDDI) Dual Attached Station (DAS) User LAN drops for user GSE or POIC ES workstations
- Ethernet Payload Operations Network (PON) drops
- Operational Intercommunication System – Digital (OIS-D) for team voice communication

- Operational TV (OTV), Broadband Communications Distribution System (BCDS), Payload Video CCTV, for video feed requirements
- multi-user data and video patches
- Commercial-Off-The-Shelf (COTS) test equipment (limited)
- video monitors
- telephones
- tables
- chairs

These systems and features are configured based on scheduled support requirements.
An orientation of the user room services is provided to PDs as required. This may include scheduling of formal training on systems such as OIS-D.

A KSC User Room Engineer will be available to assist PDs with the setup and activation of their GSE in the user room. Simulated payload data may be sent to the users workstations via a tape playback or simulation.

7.2.4 Payloads

Prior to powered testing, the PD GSE and flight hardware are properly configured to support the test. The PD GSE and stowage hardware that is required to support testing is temporarily transferred to KSC. Additional flight hardware preparations that are needed, such as installing portable computers, loading software, and installing stowage hardware are performed at this time.

Payload verification should normally occur prior to shipment to KSC. However, should verification testing be necessary at KSC, a Payload Rack Checkout Unit (PRCU) is available for use by the PD.

7.2.4.1 Payload Rack Checkout Unit

The Payload Rack Checkout Unit (PRCU) is an integration and test environment that provides a high fidelity emulation of the data and resource interfaces between the International Standard Payload Rack (ISPR) and the International Space Station (ISS). The PRCU provides data resource interface testing for one payload which may be physically contained in up to three ISPR locations. For PRCU purposes, a payload rack is defined as one or more (maximum of three) ISPR locations that are controlled by the Payload Multiplexer/Demultiplexer (MDM) as a single entity. The PRCU uses the term emulation because actual hardware and ISS Functional Equivalent Units (FEUs) are utilized to provide the physical resources (i.e. power, thermal cooling, gas, and/or vacuum) and the data resources to the payload rack under test. PRCU support test verification of a payload's interface to the Command & Data Handling (C&DH) system, the electrical and optical Internal Audio/Video (IAV) system, the Electrical Power System (EPS), the Nitrogen gaseous interfaces, the fire detection and maintenance system, the Thermal Control System (TCS), and the Vacuum System (VS). The PRCU allows the PD to complete development and verification, and to perform a post-shipment health check.

7.2.5 Flight and Ground Power Cables

To prevent hazards to personnel and damage to flight hardware, electrical checks on flight and ground power cables are performed, when appropriate, prior to initial activation of the payload. The electrical checks can include verifying proper continuity, insulation, isolation and voltage/polarity. The continuity check verifies that the power cables are wired per drawings and that there are no open circuits. This check is performed if the power cable is being installed at KSC for its first use. The insulation (Megger™ or mega-ohm) check is a verification that the wire insulation on power cables has not been damaged during installation. This check is typically performed if the installation is done at KSC and has required cable clamps. The isolation check verifies the positive and return lines of the primary (+124VDC) power circuit within the payload box or system are isolated from its structure. The voltage/polarity check verifies the voltage level and polarity are as required at the payload interface. This check is performed if the power cable is being installed at KSC for its first use.

7.3 Powered Test Operations

This section describes the KSC operations and activities that occur when an ISS payload is powered in the SSPF I-Bay for interface or functional testing. The equipment and facilities are identified followed by a scenario of a typical test day, including a listing of the types of power-on testing that are supported by the PTCS.

7.3.1 Resources

The resources required to accomplish this task include (as required):

- PTCS (power, commanding, telemetry, video, thermal control, purge gases, etc.)
- EXPRESS Rack Functional Checkout Unit
- EXPRESS Pallet Simulator
- Common Attach System Simulator
- Utilization User Room
- PD GSE (optional)
- Intermediate Bay
- SSPF Facility Services (OIS-D, video routing)

7.3.2 Test Day Activities

A payload test day consists of a pre-test briefing, PTCS activation, the payload test activities, PTCS deactivation and a post-test briefing.

A formal briefing takes place prior to (i.e., up to a week before) the scheduled test activities. This briefing provides an opportunity to discuss the test, present information on the payloads to be tested, and remind the test team of any special guidelines that must be followed while working with the flight hardware. The daily pre-test briefing takes place at the beginning of each test day. During this briefing, a summary of the previous day's work is presented and the planned test activities are discussed, along with previously unplanned work that has been added to the schedule (for example, troubleshooting/retest as a result of the previous day's activities). The PD representatives are required to attend this briefing.

In parallel with the morning pre-test briefing, the PTCS system engineers (C&DH, C&T High Rate, C&T Video, POIC-KSC, TCMS, Power and Fluids) perform their pre-operation set-ups and activate certain parts of their systems. After the pre-test briefing, the test team assembles on station in the user room. Communication between the test team is conducted through the OIS-D headset system The test conductor performs a formal call-to-stations to ensure the readiness of the entire test team. The PTCS system is then fully activated according to the day's specific test requirements identified at the pre-test briefing in order to provide command, telemetry, power, and fluid capability to the payload under test.

The appropriate level of launch site testing for each payload is previously agreed to by the PD, the ISS Payloads Office, and KSC. The following types of test activities are supported by the PTCS:

- Testing of payload-to-ISS element interfaces, including hardware and software compatibility
- Payload functionality checks, which ensure that the payload itself has not been adversely affected during transport to KSC
- Periodic maintenance (powered or non-powered)
- Troubleshooting
- Re-test of interfaces that have been modified, or broken and then reconnected, during troubleshooting

At the conclusion of the test day, the payloads are deactivated, followed by the PTCS systems, GSE and user room equipment. PTCS operations personnel deactivate and secure each of the systems brought on-line for that particular day’s testing activities. In addition, any data products generated during that test day are stored for future reference.

A post-test de-briefing occurs at the end of every test day. PD representatives are required to participate. The post-test de-briefing may be held over the OIS-D or in conjunction with the following day’s pre-test briefing if time constraints require. A summary of the day's activities are presented and discussed, followed by a discussion of the plan for the following test day. If problems are encountered that prevent completion of all test day objectives, the schedule of activities for the following test day is adjusted accordingly. Following the post-test de-briefing, the required changes are made to the SSPF schedule and resource requirements.

7.4 Post-test Activities

Post-test activities are performed after the payloads have been successfully tested and verified. The PTCS, KSC unique GSE, and user room are deactivated and reconfigured as required. In the I-Bay, the payload is safed and reconfigured by removing any supporting PD GSE, or by retrieving any stowage hardware that was being used to support the test. The PTCS power, data, fluid, gas and vacuum interfaces are then detached from the payload. Final servicing and closeouts are performed and the payloads are transferred from the I-Bay to the MPLM in the High Bay.

SECTION VIII – SSPF INTEGRATED OPERATIONS

8.1 General Description

SSPF Integrated Operations are all SSPF activities involved with integrating payload hardware with a carrier (e.g., MPLM, SLP, etc.). These operations begin when the payload hardware is transferred for integration with the carrier and conclude when the carrier leaves the SSPF. Payload activities which may occur during SSPF Integrated Operation include installation, interface verification, servicing, stowage, and closeouts.

MPLM missions are considered "Active Missions" when conditioned cargo is transported. Conditioned cargo - such as refrigerated food items or frozen biomedical/experiment samples - is installed in Refrigerator/Freezers in the MPLM at the pad and requires powered support from the MPLM during most mission phases. Active mission flows are characterized by the inclusion of Post Rack Installation Tests, Cargo Integration Test Equipment (CITE) Tests, and Orbiter T-O Interface Verification Tests.

MPLM missions are considered "Passive Missions" when only non-conditioned cargo is transported. No power-on testing occurs during a passive flow.

Attached payloads and the EXPRESS Pallet mount directly to the Orbiter, so there are no attached payload and EXPRESS Pallet carrier operations that take place during SSPF integrated operations. After transfer of the attached payload, EXPRESS pallet, or EXPRESS resupply payloads, weight and CG operations are performed. Attached payloads and EXPRESS Pallets are then installed into the canister, and EXPRESS Pallet resupply payloads are then installed onto a logistics carrier.

8.2 SSPF Integration Activities

8.2.1 Racks

Following rack closeouts, the racks are transferred for rack weight and CG operations and rack installation into the MPLM using the Rack Insertion Device (RID).

8.2.2 Attached Payloads

Following payload closeouts, the payloads are transferred for installation onto the carrier (if required) and/or installation into the canister.

8.2.3 Stowage Trays

Packed dedicated payload trays and mixed payload trays are delivered to the Resupply and Return Rack Integration Room for a crew drawer bench review. After the bench review, the applicable trays are transferred for installation into the stowage rack

8.3 Integrated Operations for Various Payload Classes

Following closeouts, the racks are transferred for rack weight and CG operations and rack installation into the MPLM using the RID. The MPLM is located in the Element Rotation Stand (ERS) for this operation.

There are no unique Facility Class Payload Rack or EXPRESS Rack integrated operations. These racks and payloads do not require power, servicing, or late access after integration into the MPLM.

Once the refrigerator/freezer racks (R/FRs) are installed in the active locations of the MPLM, the electrical and fluid connections are made. A post-rack installation test (PRIT) of the R/FRs will verify that the MPLM is providing power and data via the CITE system. The CITE R/FR test requires the MPLM to be activated via simulated orbiter or T-O power. Once the MPLM is powered, the R/FR is activated remotely or via a front panel switch, verifying power and temperature status of the internal freezer chamber via MPLM telemetry.

8.4 Payload Installation, Stowage, Servicing, and Closeouts

For racks in the MPLM, an opportunity exists approximately 2.5 months prior to launch for time critical payload installation, stowage, servicing and closeouts operations in the SSPF, if required. Requirements for these time critical operations must be specified in the OMRS.

EXPRESS Payloads that are to be installed into a rack in the MPLM first undergo payload testing in the EXPRESS Functional Checkout Unit (FCU). Payload testing is described in Section VII.

For attached payloads, an opportunity for experiment servicing and closeouts exists in the SSPF at approximately 2 months prior to launch. If required, attached payload experiments may be serviced at the launch pad depending upon accessibility. Experiment fluid servicing operations include experiment hardware inert/dry gas purging or cryogenic servicing operations. Payload closeouts may also be performed at the launch pad.

SECTION IX – ORBITER INTEGRATED OPERATIONS

9.1 General Description

At the pad, the Shuttle Flight Operations Contractor (SFOC) removes the launch package from the payload canister with the Payload Ground Handling Mechanism (PGHM) and installs it into the orbiter payload bay. Functional verification of the payload-to-orbiter interfaces is conducted, if required. As required, payload real-time test data is transmitted from the pad to the SSPF User Room. For the purposes of this section, the word payload refers to the entire payload complement (i.e. the MPLM).

At the conclusion of payload testing at the pad, payload closeout operations prior to payload bay doors (PLBD) closure will be conducted. These may include time-critical stowage, final switch setting, sharp edge inspection, protective cover removal, closeout photos, and final inspection. Payloads should terminate access before the start of the launch countdown at L-88 hours.

9.2 Equipment

The cryogenic storage freezer (CSF) requires the use of a liquid nitrogen and vacuum servicer to perform initial chilldown operations in preparation for late sample loading. Depending upon the time allowed for MELFI chilldown operations during each mission flow, dry ice may be utilized to achieve the required cooling rate.

Dry nitrogen dewars and tray handling containers are provided for transport of the CSF and Minus Eighty Degree Laboratory Freezer for ISS (MELFI) samples to the pad.

9.3 Refrigerator/Freezer Testing

The MPLM can provide power to the R/F via the orbiter, or the T-O system and GSE power supply. A test to verify these interfaces is performed, as required. Once the MPLM is powered up, KSC activates the R/F and verifies power status and cooldown of the internal chamber via MPLM telemetry.

9.4 Servicing and Closeouts

An opportunity is provided prior to launch for servicing and closeout operations at the pad for Attached Payloads, depending on accessibility. This allowable timeframe varies depending upon the payload type, but in all cases must be complete by L-88 hours.

9.5 Late Stowage

The MPLM is processed in the SSPF and then transported to the launch pad where it is vertically installed into the payload bay. During active missions, refrigerator/freezer racks (R/FRs) are installed into the MPLM in the SSPF, but conditioned cargo must be installed in the MPLM during Late Access Operations. These operations are performed at the launch pad in the Payload Changeout Room (PCR) with the MPLM powered and the payload bay doors open. If MPLM access is required at the pad for payload operations, it is provided through the hatch using the Payload Late Access Kit (PLAK).

For the MPLM to successfully support the requirements of conditioned cargo, it must have a continuous supply of power, data and cooling resources available during all ground operations in which the MPLM contains conditioned cargo.

There are five active rack locations within the MPLM which may have one of three different R/FR designs. While these R/FRs have standard physical interfaces, the three designs vary considerably in power, data and cooling requirements.

9.5.1 Plus 4/-26 Degree Refrigerator Freezer

The +4/-26 Degree Refrigerator Freezer is being developed by ESA. This freezer is primarily intended to transport consumable food items and limited science payloads to the ISS. Interfaces between the +4/-26 Degree Refrigerator Freezer and the MPLM are described in SSP 41155, Refrigerator/Freezer Rack to MPLM Interface Control Document.

9.5.2 Minus Eighty Degree Laboratory Freezer for ISS (MELFI)

The MELFI is being developed by the European Space Agency (ESA) and is intended to transport frozen science cargo at or below -80 degrees Centigrade (-80° C). Interfaces between the MELFI and the MPLM are described in SSP 41155.

Depending upon the time allowed for MELFI chilldown operations during each mission flow, dry ice may be utilized to achieve the required cooling rate. The dry ice option is not normally required due to the large window available for late stowage.

9.5.3 Minus 183 Degree Cryogenic Storage Freezer (CSF)

The -183 Degree CSF is being developed by ESA. This freezer is intended to transport frozen science cargo at or below -183° C. Interfaces between the -183 Degree CSF and the MPLM are described in SSP 41155.

The timeline for the CSF and MELFI chilldown operations during each mission flow varies depending upon the number of refrigerator/freezers (R/Fs) being flown on that particular mission. If required the CSF chilldown operations may begin prior to the power outage at L-8 days for hazardous loading. Regardless of the timeline required, the CSF chilldown is performed using a liquid nitrogen and vacuum servicer. This servicer is used to support the chilldown and to provide additional cooling during sample installation. Upon completion of sample loading, the servicer is disconnected and any required purges and leak checks are performed to verify the CSF is ready for flight.

9.5.4 Middeck Late Stowage

The latest opportunity for stowage exists in the Orbiter middeck area. Experiments transported to orbit in the Orbiter middeck will be nominally installed at the launch pad prior to the start of the mission launch countdown (prior to L-3 days). Middeck late installations occur within L-3 days and must be completed by L-17.5 hours. Refer to the Payload Integration Agreement Blank Book for Pressurized Payloads (SSP 52000-PIA-PRP) for a description of the middeck late access installation categories. If experiment time-critical items are stowed in the middeck, then the experiment is turned over from the PD to KSC so that installation into the Orbiter middeck can be completed during the time specified in the TGHR Table. The PD to KSC turnover times for middeck experiments are typically 1.5 to 2 hours, but no more than 4 hours, prior to installation into the Orbiter to accommodate KSC preparation and transportation to the launch pad. Middeck experiments requiring Orbiter fit checks have been previously fit checked while the Orbiter is in the OPF to ensure proper installation during pad operations.

Some middeck experiments require near-continuous power during transportation and installation into the Orbiter middeck. These experiments are connected to a KSC-provided 28 ± 4 volts, direct current (Vdc) GSE battery power supply. Normally, power interrupts cannot exceed 15 minutes while switching from facility power to battery power or from battery power to Orbiter power. Power interrupts to the experiment are limited to the duration specified in the OMRSD and the Time Critical Ground Handling Requirements (TGHR) Table. All orientation and IVT requirements are also satisfied as specified in the OMRSD and the Time Critical Ground Handling Requirements (TGHR) Table.

Upon arrival at the pad, the middeck experiment remains in the transport van's conditioned environment until time for installation. The middeck experiment is transported to the Orbiter white room and transferred to the Space Shuttle Program (SSP) for installation. Once installed, KSC performs the Orbiter IVT, if required. The IVT includes the instructions for switchover from battery power to Orbiter power for all middecks with near-continuous power requirements.

9.6 Launch Delay

Operations performed in the event of a launch delay are based on the unique requirements identified in the OMRS and TGHR Table and the length of the delay. In general, short delays will only affect middeck experiments, but a lengthy delay may affect items installed in the Orbiter payload bay.

For middecks, those time-critical experiments identified in the TGHR Table will be removed for return to the PD. For experiments that require near-continuous power, KSC is responsible for experiment switch over to battery power prior to experiment removal by the Space Shuttle Program (SSP). The experiments are covered to maintain cleanliness and are installed in a transportation box. Experiments that require a door-down orientation are installed into a cradle prior to installation into the transportation box. An experiment transport van is then used to transport the middeck experiment to the required facility. Upon arrival at the offline lab, the experiments are taken off of battery power and turned over to the PD via WAD for experiment reactivation using facility power. The PD may then refurbish the experiment. The experiment is turned back over to KSC along with an addendum to the IDP for reinstallation into the Orbiter per the original timeline. For short launch delays, such as 24 hours, the time available for experiment refurbishment may necessitate replacement of samples at the pad in lieu of returning the hardware to the PD. For payloads with 24 hour launch delay requirements, the PD must have redundant hardware and / or biospecimens in order to facilitate an exchange at the Pad.

In the event of a lengthy launch delay, additional Attached Payload servicing or the replacement of conditioned cargo samples in the MPLM may be required.

9.7 Postlanding

9.7.1 Nominal PostLanding Processing

After safety approval, normally within 45 minutes after landing at KSC, a conditioned GSE purge is provided to the payload bay. If landing is at KSC, Shuttle Landing Facility (SLF), time-critical middeck payloads specified in the TGHR Table are removed prior to Orbiter tow; the Orbiter is then towed to the OPF, jacked and leveled; remaining middeck items are removed; and safing/deservicing operations are completed. The remaining payloads are then removed from the payload bay and transported to the appropriate area for return to the ISSP.

At DFRC, time-critical middeck experiments specified in the TGHR Table are removed prior to Orbiter tow, the Orbiter is towed to the Mate/Demate Device (MDD), and following jacking and leveling, the remaining middeck items are removed, and safing/deservicing operations are completed. The Orbiter, with the payload aboard, is mated to the Shuttle Carrier Aircraft (SCA) for return to KSC. After arrival at KSC, the Orbiter is demated from the SCA and towed to the OPF. Following Orbiter jacking and leveling operations in the OPF, the payload is removed from the Orbiter and transported to the appropriate area for deintegration and return to the ISSP. Normally, payload removal occurs approximately 5 days after the Orbiter arrives at the OPF.

9.7.2 Intact Abort

Should an aborted flight land at KSC or at DFRC, the Space Shuttle Program will remove the middeck experiments using its best efforts. If an aborted flight lands at a site other than KSC or DFRC, the experiments stowed in the Orbiter middeck will be removed and returned by the Space Shuttle Program separately to the launch site for turnover to the PD.

If an aborted flight lands at a site other than KSC, all returned payload complement hardware in the MPLM will nominally remain onboard the Orbiter for ferry to the launch site via the SCA. However, because of non-primary landing site locations, weight, c.g., safety considerations, or mission-unique requirements, portions or all of the MPLM may be removed from the Orbiter payload bay, deintegrated (if required), and transported in ISSP-provided shipping containers by the ISSP to the launch site.

9.7.3 Early End of Mission

An Early End of Mission (EEOM) occurs if a flight lands at KSC or DFRC before the planned EOM. In this case, the Space Shuttle Program removes and dispositions the payload using its best efforts unless the payload requires EEOM support which is documented in the TGHR Table.

9.7.4 Middeck PostLanding Operations

Time-critical middeck experiments are removed from the Orbiter on the runway as agreed to in the TGHR Table. For experiments that require near-continuous power, KSC is responsible for experiment switch over to battery power prior to experiment removal by the SSP. The experiments are covered to maintain cleanliness, if required, and are installed in a transportation box. Experiments that require a vertical orientation are installed into a cradle prior to installation into the transportation box. An experiment transport van is then used to transport several middeck experiments to the required facility. Upon arrival at the offline lab, the experiments are taken off of battery power and turned over to the PD via WAD for experiment reactivation using facility power.

9.7.5 Early Destowage

For all active missions the MPLM services are connected while the Orbiter is on the landing strip as required.

When landings occur at the Kennedy Space Center (KSC), the primary landing site, conditioned cargo is removed in the OPF with the payload bay doors open. When landings occur at the alternate landing site (i.e. DFRC), conditioned cargo is removed at the Mate/Demate Device (MDD) with the payload bay doors closed.

No payload bay activities are planned until after the orbiter is safed in the OPF /MDD. At KSC, activities in the PLB begin when the PLBD are opened approximately 5 days after arrival at the OPF. At DFRC, MPLM access is provided via the Dryden Early Access Platform (DEAP) approximately 4 days after landing.

Conditioned cargo removal is performed. Dry nitrogen dewars and drawer transport containers (may be dewars) are provided for transport of the CSF and MELFI samples from the OPF/MDD to the required payload facility. The samples are then transferred for distribution to the appropriate offline labs and turnover to the PD.

Upon completion of all early access requirements, the payload is removed, installed into the canister, and transported to the SSPF. Normally, the returning hardware may be expected at the SSPF 7 days after orbiter arrival at the OPF. Subsequently, the payload is deintegrated, packaged in Developer-provided containers, and dispositioned according to PD instructions as described in Section X, Deintegration.

SECTION X – DEINTEGRATION

10.1 General Description

Physical deintegration encompasses all operations required to disassemble and turnover a payload rack, EXPRESS payload, or attached payload to the PD. Physical deintegration includes the following activities: payload deintegration, payload destowage, and payload turnover to the PD or shipment back to the PD. If the payload is turned over to the PD for offline operations at KSC, there is a turnover meeting which is chaired by KSC. The Integration Data Package (IDP) is updated and is also returned to the PD. This section covers all of the physical deintegration activities that occur in the SSPF.

The MPLM is removed from the Orbiter in the OPF, loaded into the canister, transported to the SSPF, and installed into the Element Rotation Stand in the High Bay. After gaining access to the MPLM, there is an opportunity for payload destow activities prior to rack removals. Racks are then removed from the MPLM using the Rack Insertion Device (RID) and installed in a rack handling adapter.

The carrier (if required) or attached payload is removed from the Orbiter in the OPF, loaded into the canister, transported to the SSPF High Bay. Attached payloads and EXPRESS payloads are then removed from the carrier, if required.

10.2 Equipment

Various GSE is used during the process of deintegration in the SSPF. Rack GSE includes rack access stands, rack drawer handler, and drawer delivery cart. Attached Payload GSE includes the Attached Payload Support Stand and generic slings/web straps/shackles. The MELFI and Cryo Freezer racks, which interface with the USICU for next mission processing, are installed in a rack handling adapter upper structure assembly with a KSC SSPF base assembly. Unique GSE that is required to handle a payload/experiment is to be provided by the PD.

10.3 Payload Destow

Physical deintegration includes payload passive stowage deintegration from stowage racks/trays. Stowage racks are taken to the Resupply and Return Rack Integration Room for rack deintegration. Payload items from mixed payload/station trays are transferred. Dedicated payload trays and mixed payload trays are put into a drawer delivery cart. Dedicated and mixed payload trays are deintegrated and payload stowage items are returned to PDs.

10.4 Payload Classes

10.4.1 Facility Class Payload Rack

If a Facility Class Payload Rack returns from the Space Station, the rack is removed from the MPLM and transferred to the offline lab, if required. KSC turns the rack over to the PD for offline operations or the rack is shipped back to the PD's facility.

10.4.2 EXPRESS Rack

10.4.2.1 EXPRESS Rack Initial Flight

The EXPRESS Flight Rack stays on orbit, so there are no deintegration activities for this rack.

10.4.2.2 EXPRESS Rack Resupply Flight

After removal from the MPLM, EXPRESS Transportation Racks are moved to the Intermediate Bay for physical deintegration. Payloads are removed from the Transportation Rack and turned over to the PDs for offline operations or shipped back to the PDs. A detailed inspection of the EXPRESS Transportation Rack is performed by KSC to ensure the rack is not damaged and is ready for the next flight.

10.4.3 MELFI and Cryo Freezer Racks

After removal from the MPLM, the MELFI and Cryo Freezer Racks are moved by the PME from the High Bay to the Intermediate Bay for between-mission activities.

10.4.4 Attached Payloads

After removal from the canister, attached payloads are transferred to an offline area, if required. KSC turns over the payload to the PD for offline operations or the payload is shipped back to the PD's facility.

10.4.5 EXPRESS Pallet

10.4.5.1 EXPRESS Pallet Initial Flight

The EXPRESS Pallet stays on orbit, so there are no deintegration activities for this pallet.

10.4.5.2 EXPRESS Pallet Resupply Flight

After removal from the carrier (if required), EXPRESS resupply payloads and their adapters are moved to the Intermediate Bay for physical deintegration. Payloads are removed from adapters (as required) and turned over by KSC to the PDs for offline operations or shipped back to the PDs.

10.5 Refrigerator/Freezer Between-Mission Maintenance

Between-mission activities consist of periodic maintenance, periodic servicing, and item repair.

Refrigerator/Freezer Sustaining Responsibilities are currently under Program review.

All requirements for periodic and between mission maintenance are performed during this time. Depending upon the time between mission flows, the item may require servicing or periodic operation. Any anomalies with the individual item are also resolved during this time period.

Upon the completion of the refrigerator/freezer between-mission maintenance, the rack is ready for the next mission flow with the freezer already installed.

10.6 Post-Flight Testing

When a payload has post-flight maintenance or test requirements or has an unresolved In-Flight Anomaly (IFA) requiring post-flight testing, KSC on-line test equipment is available and may be the best way to quickly accomplish post-flight testing. KSC on-line post-flight testing would likely not be performed if the IFA is low priority or if the work does not require interfaces external to the payload.

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APPENDIX A – SAFETY AND MISSION ASSURANCE

A.0 Safety and Mission Assurance (S&MA)

The primary purpose of KSC S&MA is to ensure operations at KSC responsible sites are conducted in a manner that will achieve mission safety and success. S&MA consists of the Safety, Reliability, Maintainability and Quality disciplines that are applied to enhance productivity by reducing the probability of mishaps, failures, maintenance burden, and product flaws.

A.1 Safety

Safety Assurance is the performance of all actions necessary to assure with reasonable confidence that a process and/or product will be free from chance of injury to personnel or loss of equipment or property.

A.1.1 Safety Management

As a formally established policy, KSC regards the safety and health of personnel and the protection of critical hardware and facilities to be of paramount importance. This policy influences the development and implementation of the KSC Safety Program as stated in KMI 1720.18 and implemented by KHB 1710.2. Every reasonable precaution is taken to prevent injury, equipment damage, and work interruptions. These precautions include proper designs, approved procedures, competent training, and diligent supervision of personnel. All of these factors promote safe and productive payload ground processing.

A.1.2 Safety Training And Certification

All personnel who work on flight hardware (such as build-up or test) or who perform hazardous activities are trained and certified. Without exception, personnel who are authorized to perform a critical task or to occupy a critical position are certified. The KSC Safety organization participates in the development of the training activities and approves the programs that are developed. Positions and facilities requiring specialized training and certification are identified. Protective devices and emergency equipment and their use are identified and included in safety training. Known safety hazards and safety precautions are brought to the attention of trainees. Proficiency demonstrations of training, to the greatest extent feasible, are required for hazardous operations. A current record of certification status of personnel is maintained. Safety training is provided to users as circumstances warrant.

A.1.3 Procedure Review

All hazardous and non-hazardous ground processing procedures governing integration, de-integration, testing, maintenance, and operations of payloads are reviewed by safety to assure that adequate cautions and warnings are included and that the safety protocol of the flight hardware is understood and utilized. Emergency power shutdown, procedure backout, and other measures necessary in dealing with emergency or unexpected conditions that might be encountered during the operation of payload hardware are to be included in the processing procedures. Procedures shall be approved and on the shelf at least ten days prior to hazardous operations.

A.1.4 System Safety

System safety analysis is performed to identify the hazards associated with the experiment, ground support equipment, carrier hardware, and general operations during all activity phases. This ensures intended design and performance requirements are tested and identified hazards are well documented.

A.1.5 Handling Equipment, Walking, And Work Platform Safety

Safety reviews lifting, handling, and general operations of the payload, test hardware, and associated GSE to assure that personnel are not injured or that the hardware is not damaged during processing operations. All lifting operations, including suspended loads, shall comply with safety requirements.

A.1.6 Testing of Safety Critical Equipment

The safety organization reviews payload test plans even before ground and flight-testing of safety critical equipment. The review assures the test plans include adequate control of hazards and personnel and hardware are not at undue risk.

A.1.7 Test Operations Reviews

Reviews of facilities, equipment, and procedures are made by responsible safety personnel prior to test initiation. Detailed test procedures and related documents for hazardous testing and operations are reviewed and approved by KSC safety personnel.

A.1.8 Operational Readiness Inspections

The safety organization participates in Readiness Inspections prior to performing any ground operation or test that is potentially hazardous; has a high risk in terms of program success; or involves payloads, hardware, facilities, or effort of significant expense. A safety assessment is made of facilities, test articles, support equipment, procedures, personnel training, experience, certification, and management. The safety organization also assesses previous ground test or operations data and perform visual inspection of the configuration.

A.1.9 Safety Monitoring

Hazardous tests and operations are monitored to assure safety requirements are being met and approved procedures are being used. Also, KSC Safety reserves the option to audit non-hazardous operations at KSC.

A.1.10 Experiment and Payload Carrier Processing Safety

KSC Utilization is responsible for overall experiment processing at the launch site. KSC Safety provides the following capabilities in support of experiment processing activity at KSC:

- Chairs the KSC Payload Ground Safety Review Panel; KSC Utilization supports the Payload Customer

- Review user generated hazard reports from the Phase Safety Review process

- Analyze user supplied and ISS Program-provided hazard data for ground processing impacts or concerns

- Review user initiated and KSC-developed ground processing procedures for compliance with KSC Safety policy and requirements. Approve all Hazardous ground processing procedures prior to implementation

- Surveil hazardous operations or tests conducted during the processing flow of experiment-type payloads. Assure safety requirements are satisfied during the conduct of hazardous operations or tests

As defined in NSTS 13830 and SSP 30599, KSC conducts a series of up to four ground safety reviews for each Space Station payload or experiment. The customer shall comply with the KHB 1700.7, *Space Shuttle Payload Ground Safety Handbook*.

Depending on the complexity of the payload, safety reviews may be conducted by teleconference or by mail instead of a formal on-site meeting. The results of the ground safety reviews are documented in the meeting minutes.

KSC provides the capability to conduct an analysis of experiment hazard data and relate that analysis to existing safety policy and controls established for ground operations in KSC facilities, especially the SSPF.

A.1.11 Hazardous Materials

Toxic or hazardous materials at KSC must be adequately controlled during all phases of ground processing to assure the protection of personnel and of the environment. Specific requirements to identify hazardous materials to be brought on-site, generated on-site, or sent off-site are provided in KHB 1700.7. The customer shall prepare Process Waste Questionnaires, KSC Form 26-551, in accordance with KHB 8800.7 to document any wastes that will be generated at KSC.

Hazardous materials at KSC are coordinated with the Biomedical Operations and Research Office. However, the customer is responsible for the proper handling of hazardous materials and must maintain Material Safety Data Sheets (MSDS). The customer is expected to deliver the MSDS package to KSC at least 90 days before the material arrives at KSC.

A.1.12 Pathogens and Waste Control

Operations which may expose ground processing personnel to potentially infectious materials are controlled in accordance with the requirements provided in the OSHA Bloodborne Pathogen Standard. An Exposure Control Plan required by the Standard is coordinated with the KSC medical operations personnel. Also, a Process Waste Questionnaire (PWQ), KSC Form 26-551, must be prepared for each waste producing substance. The customer delivers the PWQ package to KSC at least 90 days before arrival.

A.1.13 Radioactive Sources

All payloads that involve ionizing radiation hazards, such as radioactive materials, X-ray devices or particle accelerators, and non-ionizing radiation hazards, such as laser devices, ultraviolet or infrared devices, must comply with following requirements:

- KHB 1860.1 *KSC Ionizing Radiation Protection Program*
- KHB 1860.2 *KSC Non-Ionizing Radiation Protection Program*

A.2 Mission Assurance

Mission Assurance is the performance of all actions necessary to assure with reasonable confidence that a process and/or product: 1) will perform its required functions under defined conditions at designated times for specified operating periods; 2) may be easily maintained in accordance with prescribed requirements; and 3) will and/or does satisfy established design and/or contract technical requirements.

A.2.1 Mission Assurance Management

KSC is leading the effort to develop new and innovative payload processing tools and techniques to streamline payload processing and to ensure safe and successful missions for our customers and the Agency. Supporting this effort, Mission Assurance is continually striving for first time quality in the planning, design, development, fabrication, test, verification, and operations of products; and for faster identification, analysis, communication, and resolution of issues and risks which can adversely impact safety and mission success.

A.2.2 On-Line Operations

On-Line operations are those tasks / activities which KSC has the prime responsibility for accomplishment.

A.2.2.1 Training And Certification

Personnel who perform activities that affect quality are to be qualified on the basis of education, training, and experience. Individual directorate-level organizations define training requirements for each employee, and provide training and the appropriate level of certification for all personnel who perform activities that affect quality. The directorate-level organizations, maintains records of training.

A.2.2.2 Product Identification and Traceability

Identifying and tracing flight hardware at KSC includes maintaining the appropriate records that ensures flight items are identified by suitable means from receipt through all stages of ground processing. When traceability is a specified requirement, Mission Assurance will assure that procedures exist for unique identification of individual products or batches and compliance attained. Mission Assurance will also assure of such identification are maintained.

A.2.2.3 Process Control

Mission Assurance will assure flight hardware ground processing processes that directly affect quality are identified and planned. Mission Assurance will assure those processes are carried out under the appropriate conditions. The appropriate conditions include the following:

a. Documenting procedures for work, where the absence of such procedures could affect quality

b. Using suitable equipment and working environments for processing

c. Complying with reference standards and codes, quality plans, and documented procedures

d. Monitoring and controlling process parameters during ground processing

e. Approving processes and equipment, as appropriate

f. Observing and stipulating relevant criteria for workmanship

g. Maintaining equipment to ensure continuing process capability

A.2.2.4 Procedure Review

All ground processing procedures governing integration, de-integration, testing, maintenance, and operations of payloads are reviewed by Mission Assurance to assure the satisfaction of operational and design quality requirements are preplanned in work authorization documents (WADs) and to assure Quality verification points are preplanned in WADs.

A.2.2.5 Task/Test Operations Reviews

Mission Assurance will participate in pre task/test reviews to assure activities that constraint task/test implementation are identified and satisfied prior to the milestone being impacted. Mission Assurance will also provide assessments of readiness to proceed to the next ground-processing phase.

A.2.2.6 Task/Test Operations Implementation

Mission Assurance personnel perform inspection/witness/surveillance of ISS ground processing activities. These assessments aimed at ensuring processing tasks are performed per WAD instructions and performed within applicable KSC implementing instructions requirements. Specific items such as equipment calibration and certification dates, technician training certification, and condition of hardware are checked by quality assurance personnel and documented for corrective action if discrepancies are evident. Mission Assurance also assure nonconformance detected during operations are documented and dispostioned.

A.2.2.7 Nonconforming Articles and Materials

Mission Assurance will assure there is a documented process with appropriate records that prevents the inadvertent use or installation of nonconforming products. The KSC Nonconformance/Problem Reporting And Corrective Action (N/PRACA) System establishes the controls for the identification, documentation, evaluation, segregation, and disposition of nonconforming products and for notification to the functions concerned. The N/PRACA system is employed any time during procedure implementation, general surveillance, or process assessment activities when a nonconformance is detected. Quality Assurance personnel generate a nonconformance report per SPP Q-01. Once written, the report serves as the tool to remediate the condition. An engineer or other person designated makes disposition of the report with instructions to remediate the nonconformance or with rationale to acceptance as is without rework or repair. Dispositions are coordinated with and approved by affected parties.

A.2.2.7.1 Review and Disposition of Nonconforming Articles and Materials

SPP Q-01 defines the responsibility for review and authority for the disposition of nonconforming products. When applicable, the Material Review Board reviews nonconforming products in accordance with SPP Q-01 for rework to meet requirements, accept with or without repair, regrade for alternative applications, or reject/scrap. The proposed disposition of nonconforming is coordinated with the payload representative for approval. Quality Assurance reinspects any repaired or reworked products in accordance with documented nonconformance disposition.

A.2.2.7.2 Corrective Action

SPP Q-10 defines the process for requesting and/or implementing corrective actions. Corrective actions are taken to eliminate the causes of actual or potential product, process, or procedure nonconformances by investigating the causes of nonconformances and recording the results, determining the effective corrective actions, and ensuring such actions are taken and are effective to ensure prevention of recurrence.

A.2.2.8 Control of Quality Records

Mission Assurance will assure historical quality records are controlled and includes a process for identifying, collecting, indexing, filing, stockpiling, storing, researching, dispositioning, and archiving quality records. The purpose of these records is to demonstrate conformance to specified requirements and therefore they are legible, easily retrievable, and stored in a facility that provides a suitable environment to minimize deterioration, damage, or loss.

A.2.2.9 Process Assessments

Mission Assurance personnel perform periodic process assessments of ground processing activities at KSC. These assessments aimed at ensuring that processing tasks are performed within applicable KSC implementing instructions. Results of the assessment efforts are used as a gauge of work methodology effectiveness. It also serves as a monitor of the need for new systems or the update of current ones.

A.2.3 Off-Line Operations

Off-Line operations are those tasks / activities which the Payload Customers have the prime responsibility for accomplishment including tasks / activities to be accomplished prior to hardware turnover to KSC for farther launch site processing and tasks / activities to be accomplished after hardware turnover from KSC.

A.2.3.1 Mission Assurance Role

Mission Assurance does not have a role during off-line Payload Customer operations unless delegated by the NASA Payload Customer. When delegated, Mission Assurance is implemented per the requirements of the delegation.

APPENDIX B – ABBREVIATIONS AND ACRONYMS

AAA	Avionics Air Assembly
ABCL	As-Built Configuration List
ACS	Animal Care Section
ACAS	Active Common Attach System
AFD	Aft Flight Deck
AIT	Analysis and Integration Team
BCDS	Broadband Communications Distribution System
BDCF	Baseline Data Collection Facility
C&DH	Command and Data Handling
C&T	Communications and Tracking
CEA	Configuration Engineering Analyst
CAS	Calibrated Ancillary System Data
CBM	Common Berthing Mechanism
CCTV	Conditioned Cargo Transport Van Closed Circuit Television
CEIT	Crew Equipment Interface Test
CEWS	Cargo Element Work Stand
CIM	Customer Integration Manager
CG	Center of Gravity
CITE	Cargo Integration Test Equipment
CMU	Control and Monitor Unit
COD	Concept of Operations Document
COF	Columbus Orbiting Facility
COTS	Commercial-Off-The-Shelf
CPSM	Customer Processing Support Manager
CS	Cooling Servicer
CSD	Common Schedule Database
CSV	Convoy Support Vehicle
DAS	Dual Attached Station
DC	Direct Current
DFRC	Dryden Flight Research Center
DMR	Depot Mission Representative
ECL	Engineering Configuration List
ECLSS	Environmentally Controlled Life Support System
EF	Exposed Facility
EHHG	Experiment Hardware Handling Guide
EHS	Enhanced HOSC System
EMA	Experiments Monitoring Area
EPS	Electrical Power System
ERS	Element Rotation Stand

ABBREVIATIONS AND ACRONYMS (Continued)

ESA	European Space Agency
EXPRESS	EXpedite the PRocessing of Experiments to Space Station
FD	Fire Detection
FDDI	Fiber Distributed Data Interface
FEC	Field Engineering Change
FEU	Flight Equivalent Unit, Functional Equivalent Unit
FICP	Fluid Interface Control Panel
FT	Functional Test
FTR	Facility Trial Run
FPM	Flight Payload Manager
FRM	Fleet Resource Management
GOWG	Ground Operations Working Group
GSE	Ground Support Equipment
GSPP	Guide to Science Payload Processing
GSRD	Ground Support Requirements Document
H-CHK	Health Check
IACU	Institutional Animal Care and Use Committee
I-BAY	Intermediate Bay
IDP	Integration Data Package
IDRD	Increment Definition Requirements Document
I/F	Interface
IFA	In-Flight Anomaly
IPT	Integrated Product Team
ISIS	International Subrack Interface Standard
ISPPD	Integrated Schedule Planning Process Document
ISPR	International Standard Payload Rack
ISS	International Space Station
ISSP	International Space Station Program
ITCS	Internal Thermal Control System
IVT	Interface Verification Test
JEM	Japanese Experiment Module
JEM EF	JEM Exposed Facility
JEM PM	JEM Pressurized Module
KCSD	KSC Common Schedule Database
KSC	Kennedy Space Center
LMFE	Lead Mechanical/Fluids Engineer
LMME	Lead Mechanical Middecks Engineer
LN_2	Liquid Nitrogen

ABBREVIATIONS AND ACRONYMS (Continued)

LOLI	Limited Operational Life Item
LPIS	Launch Package Integration Stand
LPS	Launch Processing System
LSDA	Life Science Data Archive
LSSC	Life Science Support Contractor
LSSC-MS	Life Science Support Contractor – Mission Scientist
LSSE	Launch Site Support Engineer
LSSF	Life Science Support Facility
LSSP	Launch Site Support Plan
LSu	Launch Support
MATE	MDM Application Test Environment
MDD	Mate/Demate Device
MDM	Multiplexor/Demultiplexer
MEE	Middeck Experiment Engineer
MELFI	Minus Eighty Degree Laboratory Freezer for ISS
MLI	Multi-layered Insulation
MLP	Mobile Launch Platform
MMS	Master Milestone Schedule
MPLM	Multi-Purpose Logistics Module
MPS	Mission Processing Schedule
MPT	Mission Processing Team
MS	Mission Scientist
MSFC	Marshall Space Flight Center
NASDA	National Aeronautics and Space Development Agency
NPO	NASA Payload Operations
NSTS	National Space Transportation System
OES	Orbital Environmental Simulator
OIS-D	Operational Intercommunication System - Digital
OLPA	Off-Line Processing Area
OLPAM	OLPA Manager
OMRS	Operations and Maintenance Requirements Specification
OPF	Orbiter Processing Facility
OR/OD	Operations Requirements/Operations Directive
PCR	Payload Changeout Room
PCS	Portable Computer System
PD	Payload Developer
PDL	Payload Data Library
PDMS	Payload Data Management System
PDS BB	Payload Data Set Blank Book
PDV	Post-Delivery Verification
PEHG	Payload Ethernet/Hub Gateway

ABBREVIATIONS AND ACRONYMS (Continued)

PFE	Payload Fluids Engineer
PFSSF	Post-Flight Science Support Facility
PGOC	Payload Ground Operations Contractor
PIC	Pre-Integration Checkout
PICS	Payload Integration Control Schedule
PLBD	Payload Bay Doors
PLE	Payload Lead Electrical Engineer
PL MDM	Payload Multiplexer/DeMultiplexer
PM	Payload Manager
PME	Payload Mechanical Engineer
PMN	Program Model Number
PMP	Payload Mounting Panel
POE	Payload Operations Engineer
POIC-KSC	Payload Operations Integration Center at KSC
PON	Payloads Operation Network
POP	Program Operating Plan
PPS	Payload Processing Schedule
PPT	Payload Processing Team
PRACA	Problem Reporting and Corrective Action
PRD/PSP	Program Requirements Document/Program Support Plan
PRIT	Post-Rack Installation Test
PTCS	Payload Test and Checkout System
PTE	Payload Test Engineer
PTT	Payload Test Team
PVT	Payload Verification Test
QD	Quick Disconnect
R&R	Resupply and Return
RF	Radio Frequency
R/FR	Refrigerator/Freezer Rack
RHA	Rack Handling Adapter
RID	Rack Insertion Device
RMRS	Repeatable Maintenance Recall System
SCA	Shuttle Carrier Aircraft
SE	Support Equipment
SFOC	Shuttle Flight Operations Contractor
SLF	Shuttle Landing Facility
SLP	Spacelab Logistics Pallet
S/N	Serial Number
SPP	Standard Practices and Procedures
SSP	Space Shuttle Program
SSPF	Space Station Processing Facility
SRDS	Support Requirements Data Set

ABBREVIATIONS AND ACRONYMS (Continued)

SVT	Science Verification Test
SU	Servicing Unit
TBD	To Be Determined
TCMS	Test, Checkout and Monitor System
TCS	Thermal Control System
TEP	Team Execution Plan
TGHR	Time Critical Ground Handling Requirements
TIM	Technical Integration Manager
TREK	Telescience Resource Kit
TTA	Technical Task Agreement
TUP	Tactical Utilization Plan
URE	User Room Engineer
UIPT	Utilization Integrated Product Team (KSC)
UMA	Unpressurized Mating Assembly
USICU	United States ISPR Checkout Unit
USL	United States Laboratory
UTD	Utilization Test Director
V	Volt(age)
VES	Vacuum Exhaust System
VRS	Vacuum Resource System
WAD	Work Authorization Document

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APPENDIX C – SCHEDULE TEMPLATES

Select the web address below to access generic schedules:

http://www-ss.ksc.nasa.gov/UTILIZATION/classes.htm

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